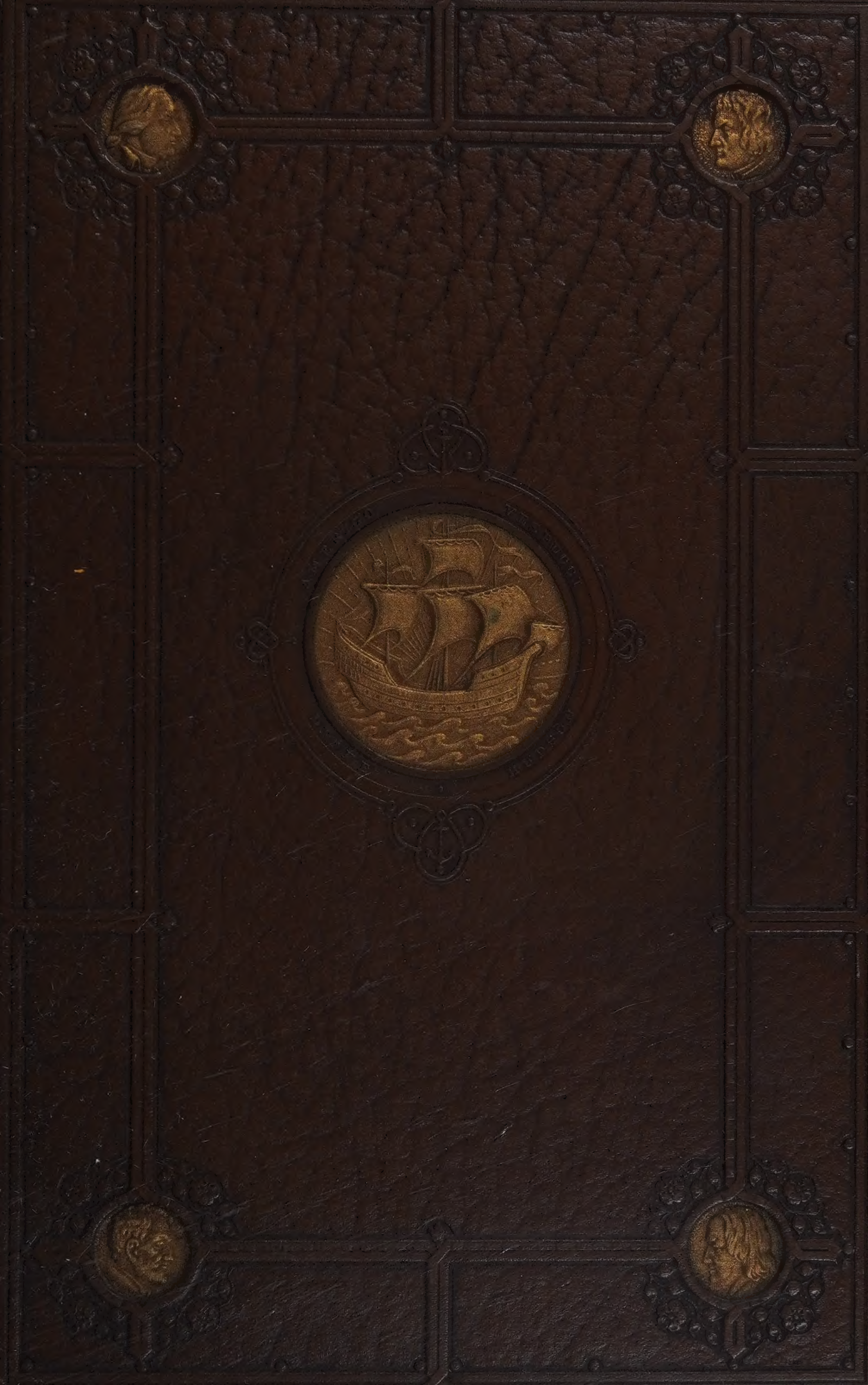

H. A. BARRINGTON
SANTA CRUZ, CAL.

The
BOOK *of* KNOWLEDGE

The Children's Encyclopedia

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DEPARTMENTS

The Earth
Stories and Legends
All Countries
Golden Deeds
Helps to Learning
Literature
Animal Life
Famous Books
Dominion of Canada
The United States
Familiar Things
Our Own Life
The Fine Arts
Men and Women
Poetry and Rhymes
Plant Life
Things to Make
and Things to Do
Book of Wonder

VOLUME II

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A ②

CONTENTS OF THIS VOLUME

This is a short guide to the principal contents of this volume. It is not possible to give all of the questions in The Book of Wonder, or the titles of all of the Little Verses and Problems, but in all cases the pages are given where such sections of the book begin. In the big Index, Volume 20, you will find every title and every subject, including the pictures.

PAGE

THE BOOK OF THE EARTH

Inside the Wonderful Ball . . 385
How Fire and Water Made the World . 525
How Sun and Wind Made the Hills . 629

THE BOOK OF PLANT LIFE

Birth, Life and Death of a Plant . . 503
How Plants Work for Their Living . 613
How Plants Move and Feel . . 743

THE BOOK OF ANIMAL LIFE

Big Cats and Little Cats . . . 493
The Wild Dogs 597
The Friendly Dogs 711

THE BOOK OF OUR OWN LIFE

The Tiniest Living Things . . . 437
Our Unseen Friends and Foes . . 557
The Very Seat of Life . . . 661

THE BOOK OF WONDER

How do ships sail against the wind? . 455
Can any animal live for years without food? 457
How does a fly walk on the ceiling? . 457
How does a plant melt its way through ice? 459
Why is so much of nature green? . 460
What does the name of England mean? 461
How does a magnifying glass make things bigger? 462
Does the moon pull the sea? . . 583
What is there inside the jumping bean? 584
What is known as the Great Rift Valley? 584
Why does a moth fly round a candle? 585
Does sound travel in straight lines? . 586
Does a plant go to sleep? . . . 685
Why do we not see the stars by day? . 686
Why do our tears taste of salt? . . 688

THE BOOK OF FAMILIAR THINGS

The Wonder of a Train . . . 409
How We Get Our Ice . . . 529
Where Gaslight Comes From . . 635
The Story in a Teacup . . . 761

THE BOOK OF LITERATURE

The Greatest Book in English . . 473
A Shining Splendor Comes . . 721

PAGE

THE STORY OF THE FINE ARTS

Ægean and Classical Painting . . 447
A Great Light Shines . . . 575
The Wonder Men of Florence . . 691

THE BOOK OF ALL COUNTRIES

The Chinese Republic . . . 421
Japan and Korea 561
Babylonia and Assyria . . . 647

THE BOOK OF THE UNITED STATES

Some Famous Ladies of the White House 391
Building Homes in the New Land . 543
Yellowstone Park, Wonderland of the West 729

THE BOOK OF CANADA

French Canada before the Conquest . 677

THE BOOK OF MEN AND WOMEN

The Explorers of Africa . . . 465
Some European Men of Science . . 589
The Great Greeks 701

FAMOUS BOOKS

Robinson Crusoe 665

THE BOOK OF GOLDEN DEEDS

Brave Grizel Hume 441
The Man Who Loved the House . . 443
A Heroine of the Southern Seas . 446

THE BOOK OF STORIES

Robin Hood and His Merry Men . 397
A Pair of Magic Slippers . . . 402
The Fairies of St. David . . . 404
The Lord of the Lions . . . 404
Ali Baba and the Forty Thieves . . 537
Fables of Æsop the Slave . . . 539
The Witch's Ring 541
Little Claus and Big Claus . . . 755
The Search for the Real Princess . 756
Dick Whittington and His Cat . . 758

THE BOOK OF POETRY

PAGE
Why Should We Read Poetry? . . 481
Who Can This Somebody Be? . . 482
The Battle of Blenheim . . . 483
Father William 484
The Little Busy Bee 484
A Psalm of Life 484
The Minstrel Boy 484
A Child's Evening Prayer . . . 485
The Fairies 485
Columbus 485
The Twenty-third Psalm . . . 486
Rule, Britannia! 486
A Child's Thought of God . . 486
Baby 486
King Cophetua and the Beggar Maid . 487
The Fool's Prayer 488
Here a Little Child I Stand . . 488
Opportunity 488
Allan Water 488
Annabel Lee 489
To the Moon 489
Give a Man a Horse He Can Ride . 489
To Celia 489
The Violet 489
The Nonsense of Edward Lear . . 490
How to Read Poetry . . . 605
The Lamb 606
Lucy 606
Fairy Song 606
The Sluggard 606
Nightingale and Glow-worm . . 606
The Fountain 607
Boy's Song 607
The Burial of Sir John Moore . . 607
All's Right with the World . . 607
The Rainbow 607
Arab's Farewell to His Steed . . 608
The Unseen Playmate . . . 608
The Stars 609
Excelsior 609
Ye Mariners of England . . . 609
How to Remember Poetry . . . 735
The Beggar Maid 736
Lullaby of an Infant Chief . . 736
My Mother 736
Wee Willie Winkie 736
Lord Ullin's Daughter . . . 737
Bannockburn 738
Pictures in the Fire 738
What Everyone Knows . . . 738
The World 738
Little Verses (with music)
492, 610, 611, 739, 741

THINGS TO MAKE AND THINGS TO DO

PAGE
Toy animals for you to make . . 511
John Chinaman made of peanuts . 512
Making a flower-box for the window . 513
Boat, raft and family made of cork . 514
How to make a girl's workbox . . 515
How to make Little Red Ridinghood dolls 516
The mystery of telegraphing thought . 518
Learning the art of block printing . 617
How to remove stains . . . 618
What to do with a girl's workbasket . 619
Arranging flowers for the house . 620
How to test for pure silk . . . 621
The magic of a glass of water . . 622
The ball that answers questions . 623
Knotty problems to solve . . . 624
Home-made tents 624
Model gliders that a boy can make . 625
How bread is made 626
How to make invisible ink . . . 626
A fairy-fountain experiment . . 627
How to renew the edge of your screw-driver 627
Suggestions for young mechanics . 628
A simple way of drawing a spirited horse 628
How to sleep 628
Make a sugar scoop from tin cans . 747
Mustard and cress grown anywhere . 748
A handy writing-board . . . 749
How to hide in the open country . 749
May baskets made with paper strips . 750
Make and use a simple booklet . . 750
Little problems for clever people . 751
How did the ladies cut the carpet? . 751
Recipes for candy 752
Queer pictures built up from squares . 753
A trick you can play with a book . 753
Puzzle pictures from English history . 754

HELPS TO LEARNING

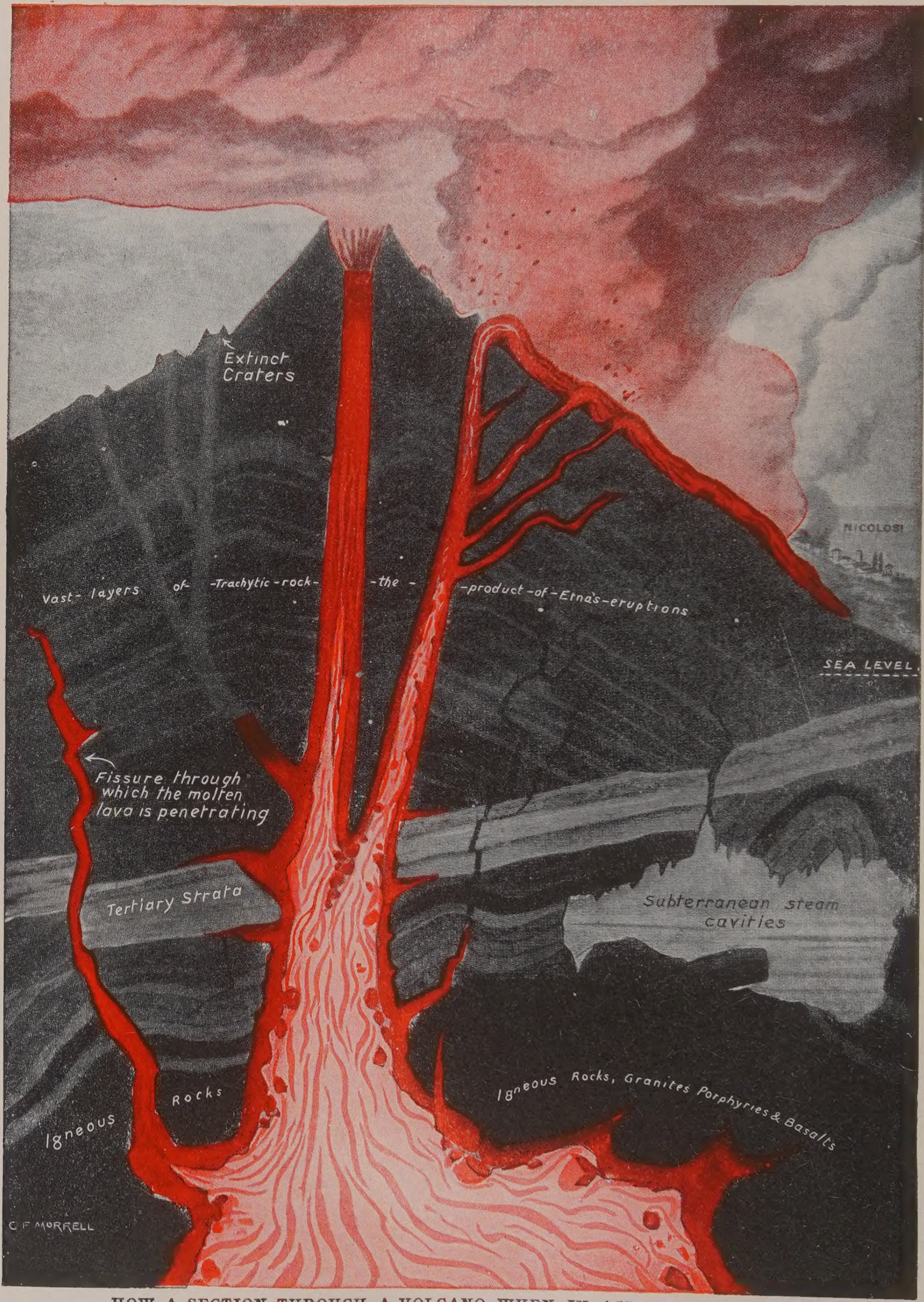
MORE WORTHWHILE GAMES

Making a Score Book . . . 519
Learning to Know the Digits . . 520
Writing the Digits 522
Making a Big Wheel for Matching Games 522
What Have You Learned? 523

COLORED PLATES

An Imaginary Section through Mt. Aetna 385
The Wonder of a Train . . 405–408
Pictures of China . . . 425–428
The Lovely Books of Long Ago . 477–480
Members of the Great Cat Family . 497–500
The Dawn of Italy's Golden Age . 693–696
A Kennelful of Dogs . . 713–716

AN IMAGINARY SECTION THROUGH MT. ÆTNA


Extinct Craters
Vast layers of Trachytic rock the product of Etna's eruptions
NICOLOSI
SEA LEVEL
Fissure through which the molten lava is penetrating
Tertiary Strata
Subterranean steam cavities
Igneous Rocks
Igneous Rocks, Granites Porphyries & Basalts
C F MORRELL

HOW A SECTION THROUGH A VOLCANO WHEN IN ACTION MIGHT LOOK

The boy's iron ball and the girl's balloon have the same volume, but different mass.

INSIDE THE WONDERFUL BALL

CONTINUED FROM 239

LET us think of the earth as a colossal ball, a baseball of a size unthinkable. A baseball has a certain weight, it has a cover, and inside this there is a core made of certain materials put together in a particular way. A baseball is elastic, so that when you throw it against a wall it comes back again instead of spreading out and sticking to the wall, as a lump of mud would. Now, in the same way, we must look at the qualities of the great earth-ball, tiny little pieces of which we put together to make baseballs, cathedrals and other things.

In the first place, let us consider the size of this big ball. It measures round its circumference, roughly speaking, 25,000 miles. It is difficult to imagine such a great distance as 25,000 miles; yet, compared with some other things, the earth is really small. There is a very good way of comparing the size of the earth with that of the sun. If the centre of the sun could be placed at the centre of the earth, the surface of the sun would reach far beyond the distance that the moon is from the earth—that is to say, the sun occupies far more space than the whole of the space swept by the earth and the moon moving steadily round her.

We will not bother with the figures which say how many square miles there are on the surface of the earth, or how many millions of millions of tons it weighs, because we cannot realize what these figures mean, and so they are of no use to us at present. There is, however, one enormously interesting thing about the earth which can be expressed in a way which we understand, and which is interesting because it means so much; and that is the question of the density of the earth. Let us see what density is; how the density of the earth can be found out; and what the earth's density is, and what it means.

A lawn-tennis ball is bigger than a golf-ball but it is not so heavy. There is more stuff in the golf-ball than in the tennis-ball. A big piece of coal is heavier than a small piece of coal; there is more stuff in the bigger piece. But if you took two pieces of the same size and kind they would be the same weight—that is to say, they would have the same amount of stuff in them. Now, there is a special word for the size of a thing—for the amount of space it occupies. This special name is volume, and it is not difficult to understand, for it only means size, or bigness.

Now, as the tennis-ball and the golf-ball show, the volume of a thing tells us nothing about its weight, or, rather, about the amount of stuff in it—unless we can compare it with a different volume of the same material, as in the case of pieces of coal of different sizes. So we want a special word to express the amount of stuff there is in any particular kind of thing as compared with a similar volume, or size, or bigness, of something else. You know what a cube is—a thing like the bricks you used to use for making pictures. If you can imagine a cube of water, such as you might have by pouring water into a cubical vessel, that would have a certain amount of stuff in it according to the size of the cube. If you poured the water out and filled the cube with mercury instead, you would have the same volume, or size, or bigness, of mercury, but it would be much heavier.

The mercury gets more stuff into the same space than the water does. Now, the proper way of saying this is that the mercury is *denser*, or has a greater *mass*, than the water. Perhaps you will say that you do not see any reason why we should not say the mercury is heavier than the water, but the objection is that, though it is quite true for here and now, yet the heaviness, or weight, of a thing depends upon the earth's pull for it and its pull for the earth; whereas the amount of stuff in it—which is what we are interested in—would remain the same even if the earth were moved a million miles away, and so could hardly pull at all.

WHY THE SAME THING DOES NOT ALWAYS WEIGH THE SAME

Therefore, instead of describing the amount of stuff in a thing by the word *weight*, we use the word *mass*, or *denseness*; and the mass of a thing would remain the same even if it were moved to the moon, where it would weigh far less, as the moon is smaller and therefore pulls less hard.

Now, in order to compare the density, or *mass*, of different things, we take a certain volume of water under certain conditions, and call its density *one*; then, if we find that something else is twice as massive, or dense, as water, we say that its density is *two*—and so on. If the thing we were comparing with water were at the same distance from the centre of the earth, then, if it were twice as dense as the water, the same volume, or bigness, of it would be twice as heavy, or would weigh twice as much.

Let us take one more illustration of why it is that the same thing does not always weigh the same. If we take two metal cubes of exactly the same size and material, and place them side by side on a flat table, then, besides being of the same density, or mass, they are also of the same weight. But if, instead of having the two cubes side by side, you put one on top of the other, though they are still of the same density, though there is still the same amount of stuff in the one as in the other, it can be shown that the one which is above weighs less than the other, because it is *a little bit farther from the earth*, and therefore the earth and it do not pull each other quite so hard! Let us agree, therefore, that there is some sense in distinguishing between mass and weight.

HOW DO WE FIND OUT THE MYSTERIES OF THE EARTH?

How are we to find out what is the density of the earth? How are we to find out whether this great ball is less massive or dense than water, or more massive or dense? This is a problem which men of science have long been engaged on, and it has been thought out in various ways. Just now, perhaps, it is enough to say that if we can measure the extent to which the earth makes a pendulum swing, and the rate at which the pendulum swings, we can measure the force with which the earth acts upon it, and, therefore, as we already know the size, or volume, or bigness, of the earth, we can say how dense it is—that is to say, how tightly the stuff in it is packed.

Now the extremely remarkable conclusion to which we come is that the earth is somewhere between four and six times as dense as water, and the stuff in the inside of it must be squeezed together more tightly than we can imagine. None of the things we know and can examine at the surface of the earth, no rocks or coal, or anything of that sort, is nearly as dense as this average density of the earth, and, therefore, away down beneath us, the stuff of which the earth is made must be so tightly packed that the densest things we know, such as lead, can be almost nothing compared with it.

THE THIN CRUST OF THE EARTH UPON WHICH WE LIVE

This is not only very interesting in itself, but it is also important because of what it tells us as to the tremendous forces which are, so to speak, chained up underneath the earth's crust.

Sometimes, as we know, these show themselves by means of earthquakes. It is also interesting to know that the crust of the earth, compared with the whole size of the earth, is really extremely thin. It feels firm enough under our feet, and there is no fear of its cracking and letting us through, but if the earth could be cut right through the middle, like an orange, we should be very much astonished, if we could take a sort of bird's-eye view of the whole cut surface, to see how thin is the crust on which we walk, and from which all living things have been produced.

Of course, when we learn that the inside of the earth has this extraordinary density, we are apt to think of it as solid—far more solid than lead. But another great fact about it is that it is intensely hot, so hot that no heat we know on the surface of the earth can compare with it. It is, indeed, probable that the inside of the earth is so hot that the stuff of which it is made is not really solid at all. On the other hand, we may be wrong in thinking of it as liquid or as a gas, for it is more than likely that matter inside the earth, owing to heat and pressure, has a state which is like nothing that we know.

IF WE COULD THROW THE EARTH AT A WALL IT WOULD BOUNCE!

We said something a little while ago about a baseball's being elastic, so that when it is thrown against a wall it comes back again, instead of spreading out and sticking there like a lump of wet mud. When we say that a thing is elastic, we simply mean that when it is put out of its shape it comes back to its old shape as soon as it can. When the baseball hits the wall, it is flattened at one part for a twinkling of time, and then it springs back to its original shape, and that makes it bound back from the wall.

Now, if you could throw the great ball called the earth against a wall, it would spring back more perfectly than a baseball, more perfectly than a ball of steel.

There are cheap kinds of balls which are called composition balls. This means that they are a composition of a number of things put together. Well, the earth is also a composition made up of a large number of different materials put together in a particular way, and this question of the composition of the earth is immensely interesting. But before we go into that let us look at one of the latest things we have learned about the composition of the earth, because it tells us far more than ever we knew before about the earth's history, about what is happening to it now, and about the wonderful way in which it is kept warm.

This is a perfectly wonderful discovery. The special kind of stuff with which it deals is very rare, but it is one of the substances which make up the earth. There is so little of it that, if the stuff were not so wonderful in itself, it would not be worth mentioning. Its name is radium. Before we consider why its discovery is so important, we shall ask ourselves in what ways the earth might be kept warm.

YEAR IN, YEAR OUT, THE EARTH IS LOSING ITS HEAT

In the first place, the earth might be kept warm by the heat of the sun—of which we catch only a very tiny amount, of course, but still enough to produce all the life on the earth, our own included. However, during the night the earth throws back into space some of the heat which is got from the sun during the day, and as we know what night and day mean, we know that all the time one half of the earth is getting heat from the sun the other half is losing it.

Secondly, we know that the earth is kept warm by the heat in its inside. The heat from the inside simply soaks outward and keeps the crust warm, and then it passes away from the crust into the air.

Year in, year out, then, the earth is slowly giving forth heat, and, clearly, this could not go on forever. The moon, of course, was hot when it began, but it has got cool much faster than the earth because it is so very much smaller. A small thing always loses its heat faster than a big thing, because a small thing has a bigger amount of surface to lose its heat by in proportion to the amount of stuff in it. That is one reason why a baby has to be kept more warmly clad than a grown person.

FOR EVER AND EVER THE EARTH MAKES NEW HEAT FOR ITSELF

But, in spite of all we have said, the earth is not losing heat. A few years ago the astonishing discovery was made of another way, dreamed of by nobody until this century, in which the earth is kept warm, and has for ages past been kept warm, and will be kept warm for no one can say how many ages to come.

It is true that the earth is giving forth its heat, but we have discovered that, while it is giving forth heat, it is actually *making new heat for itself*.

Of course you see the importance of this. If you have six pennies in your pocket, and spend one every day, when a week is out you will have nothing left. But if, while still spending, you can also make a new penny every day—well, you can go on for a long time at that rate! Now, that is what the earth is doing. It is spending its heat—which is a good thing for us, for we should not be here without it—but it is also making new heat. Nay, more; there is every reason to believe that the earth is making every day, or every year, or every million years, at least as much heat as it loses. Now, the wonderful stuff which makes the new heat for the earth is radium.

THE MOST WONDERFUL OF ALL THE ELEMENTS WE KNOW

It used to be thought that there were four elements—earth, air, fire and water—and boys and girls still play a game based on that idea. But now we know that none of these is really an element. There are real elements, however, such as lead and gold and silver and quicksilver and oxygen. Well, radium is just another of these elements. It is one of the last to be discovered, perhaps one of the rarest of all elements; but it is far more wonderful than all the other elements put together.

Now, one of the wonderful things about radium is that it is all the time making heat out of itself. Lead and silver and oxygen cannot do this. If they are warm it is because something has made them warm from outside, just as the poker—which is made of the element iron—becomes warm if you put it in the fire. But radium left by itself, without any warmth from outside, makes heat for itself, and, wherever you find it, it is always a little hotter than its surroundings—unlike the common things we know, except, of course, fire itself, and the heat produced by a fire is really heat from the sun, which was stored up in the coal and was given out again.

THE STRANGE POWER IN RADIUM THAT WILL HEAT THE EARTH FOR AGES

The extraordinary thing about radium is that it does not require to be burned in order to make heat, and that the heat which it makes is not the sun's heat of the past given out again, but is absolutely made brand new, so to speak, on the spot.

Our new discovery, then, does not mean that the earth has a source of heat which can never be used up, but that it has means of making heat which will probably not be exhausted for ages longer than we can think about.

But we have left out something; we have not satisfied ourselves that there is enough radium to do all these things. All the radium in the world *that has been collected* would not weigh as much as a golf-ball! Not only so, but there are only a few known places in the world in which radium can be found. Little veins of stuff containing it are found in England, and there is a considerably larger quantity in Bohemia and in Colorado and Utah.

Yet, curiously enough, while there is only very little of it to be found anywhere, there is *a very little of it to be found everywhere.* Men have taken samples of water and every kind of earth and rock that we can think of, and wherever they make tests to find whether radium is present, there they invariably find it. Of course, the amount is extremely tiny.

NO MAN WILL EVER GET DOWN TO THE CENTRE OF THE EARTH

Now you will say next that, even supposing there is this tiny amount of radium in rocks and minerals in general, all over the crust of the earth, and even supposing that some such quantity as this could be found in all the stuff that makes up the crust of the earth—which is supposed to be about forty or fifty miles thick—yet surely such a tiny proportion could not be enough to make up, day by day, for the amount of heat which the earth is always losing into space. But the extraordinary fact is that this very small amount of radium actually is enough for the production of enough heat to keep the earth as warm as it is, as warm as it has been for ages past, and as warm as it will be for ages to come.

Now let us think over something very wonderful. Here we are on this earth of ours, and we cannot leave it; but you might at least think that, though we cannot leave it alive, and perhaps do not want to leave it, at any rate we can thoroughly examine every part of it. Now, this is not so. There are parts of the earth, even at the surface of it, which no human eye has ever seen, and only in recent years have we reached the North and South Poles. The ocean of air that floats above us is part of the earth, of course, and it probably extends at least something like a hundred miles high. No one has ever been as high as a tenth part of this distance.

Then, again, as to digging downward. Certainly no human being will ever get down to the interior of the earth. His whole body would have melted into gas long before he got there. But take this thin crust, which has produced such wonders. Compared with the whole thickness of the earth, it is a mere nothing—40 miles out of 8,000; that is to say, the earth is two hundred times as thick as the crust.

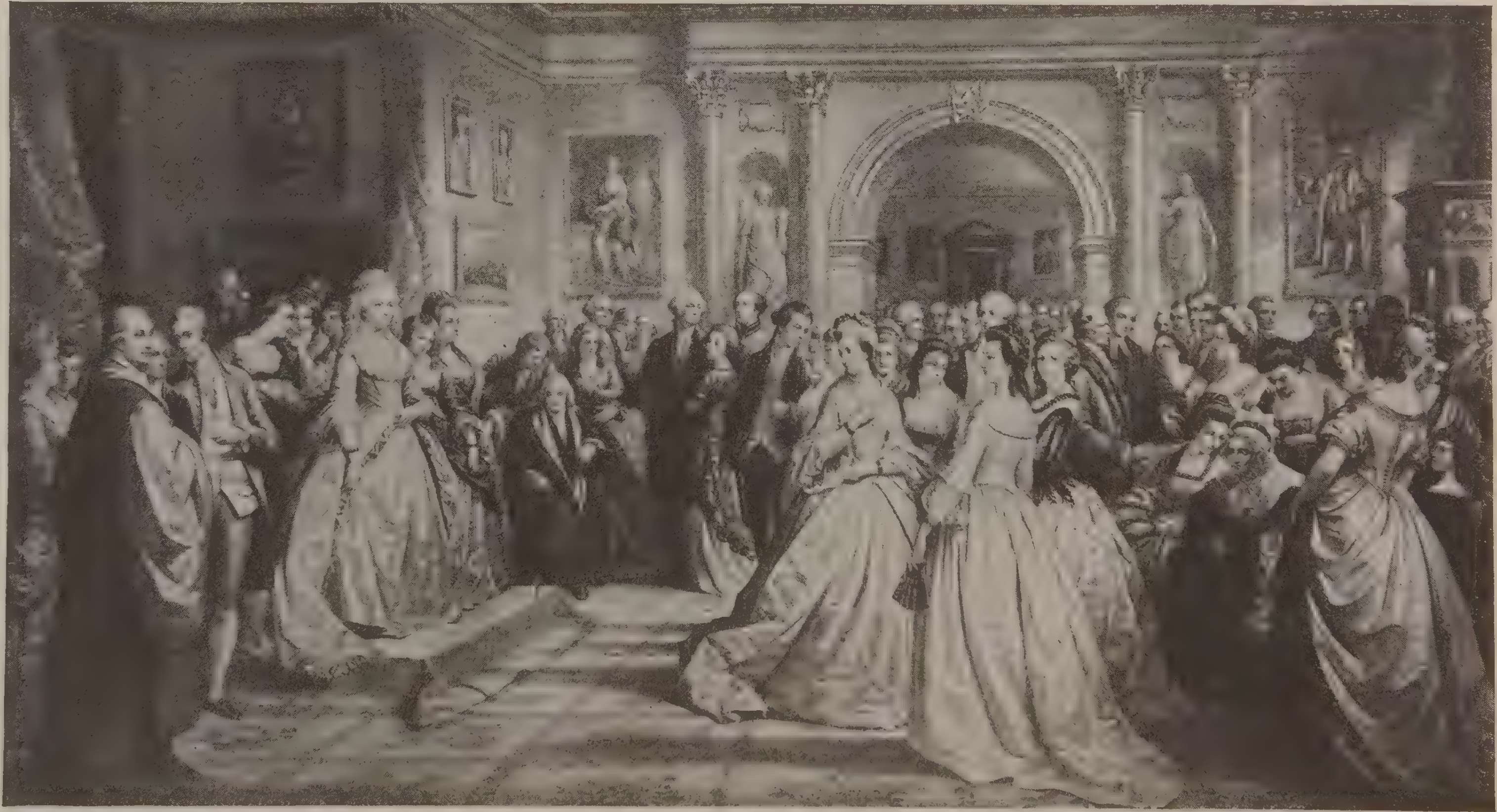
A little while ago we were talking about cutting the earth in half and seeing what it would look like. What have we done in the way of cutting into this thin crust that supports us? Practically nothing. We measure coal-mines by thousands of feet, but as we go down it gets very hot, and it is a very serious matter to get air enough down to these levels. When all is said and done, the deepest coal-mine has only got as far as the coal level, and that, compared with the whole crust of the earth, is almost nothing at all.

Yet every day the mind is teaching us more about the earth. Every day the eyes of our minds are getting to see farther and farther, and wider and wider, and to see more and more at a time, and to understand what it is that they see.

Inside the earth—the solid crust and the raging furnace beneath.

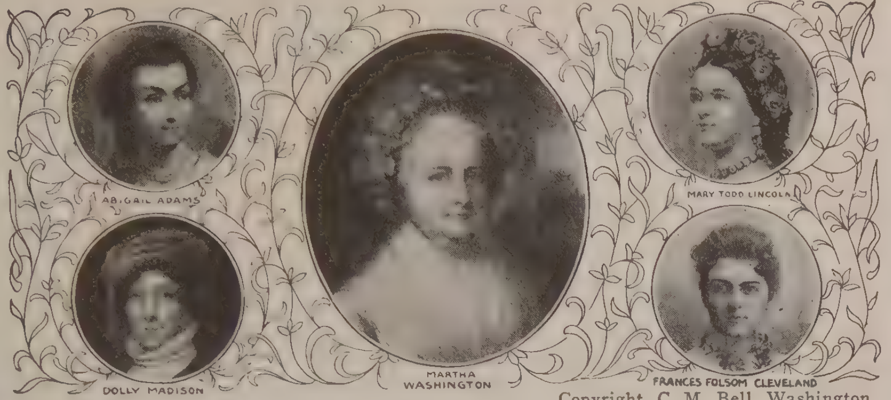
THE NEXT STORY OF THE EARTH IS ON PAGE 525.

MARTHA WASHINGTON, THE HOSTESS OF LONG AGO



During Washington's two administrations the seat of government was first in New York and then in Philadelphia. Above is a picture showing Martha Washington receiving at one of her levees. All the formality and stiffness of court manners were observed, and no one was admitted to the receptions who was not dressed according to rules of etiquette which had been established by the first lady of the land. Many of the faces in this painting are portraits. You can see Washington himself in the centre of the picture and at the extreme left are Chief Justice John Jay and Alexander Hamilton, Secretary of the Treasury. Note the elaborate gowns of the ladies.

From an old print.



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SOME FAMOUS LADIES OF THE WHITE HOUSE

CONTINUED FROM 370

MANY of our boys and girls have visited the city of Washington, and some perhaps have passed through the large, stately rooms of the Executive Mansion. It has been said that wherever a womanly woman makes her home her influence lives after she has gone; and the White House is no exception to this rule. Every room overflows with memories of the hostesses who, as the wives of the presidents, have dispensed the hospitality of the nation. We can never speak of the White House without seeing in our minds visions of those women whose names are interwoven with its history—Abigail Adams, her brave little face framed by its delicate cap frill of lace; Dolly Madison, fleeing before the British with the spoons of the Executive Mansion tucked safely away in her pockets; Mrs. Cleveland, the young bride of the White House, graciously receiving the representatives of the nation.

The very name, the "White House," according to some writers, owes its origin to a woman, Martha Custis Washington, the wife of our first president, although she never lived there, for the house was not finished when Washington's second term expired. When Congress considered the subject of building a place of residence for its executives, General Washington, who had much influence with the committee in charge, chose the location. Only a few days before his death he walked through the unfinished rooms. There is a story that it was called The White House in honor of the country seat where he had gone to claim his bride, but this is doubtful. It is more probable that it was so called because it was painted white to hide the smoke-stains on the walls after the British burned it in 1814.

MARTHA WASHINGTON, THE WIFE OF THE FIRST PRESIDENT

When Washington was inaugurated for the first time, the seat of government was in New York City, and there, in a large old-fashioned house, Mrs. Washington held her levees. With the aid of Alexander Hamilton, she established strict rules of etiquette for her drawing-rooms, and the picture on the opposite page represents very truthfully the formality with which they were conducted. No one was permitted to attend who was not gowned according to the rules laid down, and, in fact, dignity and stateliness, not to say stiffness, reigned supreme.

Mrs. Washington herself, while precise and dignified, was a kind-hearted little lady, with frank hazel eyes, and engaging manners that soon endeared her to all those with whom she came in contact. Simple in her dress, with great quietness of taste in the ordering of her household, she was a model housewife. Her gowns and many of the suits worn by her husband were woven in her own household. It is said that the suit in which Washington was inaugurated was thus prepared. Accustomed to the busy but peaceful life of the wife of a Southern planter, Mrs. Washington bore her change to the gay life of the metropolis very serenely. While her public receptions were very formal, she preferred, in the exercise of her private hospitality, to entertain her friends with the simple lavishness of an American hostess, rather than with the brilliancy and display of a foreign court.

Above all, Martha Washington was a true wife. Naturally gentle and loving in disposition, she subdued her personality in every way to that of her husband. He was her will, her law, her very rock of strength, even as he proved the rock on which we built the firm and sure foundations of our nation. Mrs. Washington became so filled with her husband's ideas that she could, at times, scarcely tell them from her own. As the years went by, people began to note that her soft features took on something of the look of the President's sterner ones, until all spoke of the wonderful likeness between the two. He, on his part, returned her adoration with a courtly consideration and all the protective gentleness of a strong nature for a dearly loved weaker one.

In the second year of Washington's administration the seat of government was removed to Philadelphia. There Mrs. Washington lived until her husband's term of service ended and then at once proceeded to remove their belongings to their home, Mount Vernon, where you may see to this day the very objects used by the household of the first president. The house and grounds have been preserved for the American people by an association of patriotic women. With a light heart and much happy anticipation for the future, Martha Washington, in 1797, returned once more to the quiet life of a Southern plantation, which she loved more than high position.

A few short years of peace and happiness were passed at Mount Vernon, when the shock and desolation of widowhood descended upon the contented wife. The nation joined her in mourning the loss of one of the strongest and truest natures it can ever know. But nothing could bring consolation to the woman who had lost her tower of strength. Her heart was broken. Her mind never quite recovered from the shock, and three years later she was laid to rest beside her noble husband.

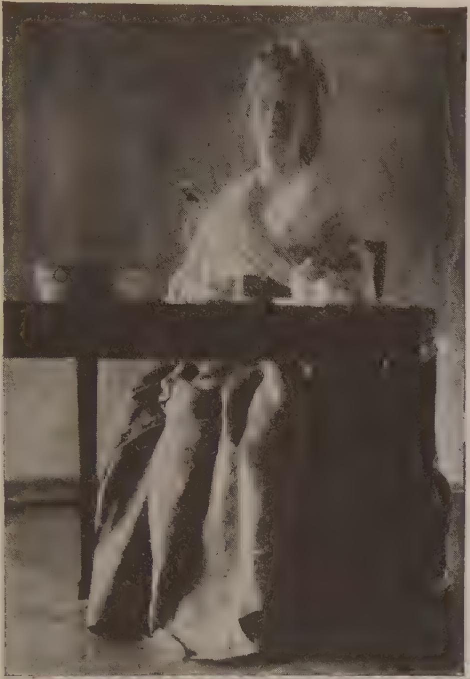
ABIGAIL ADAMS, THE LADY OF THE LACE CAP

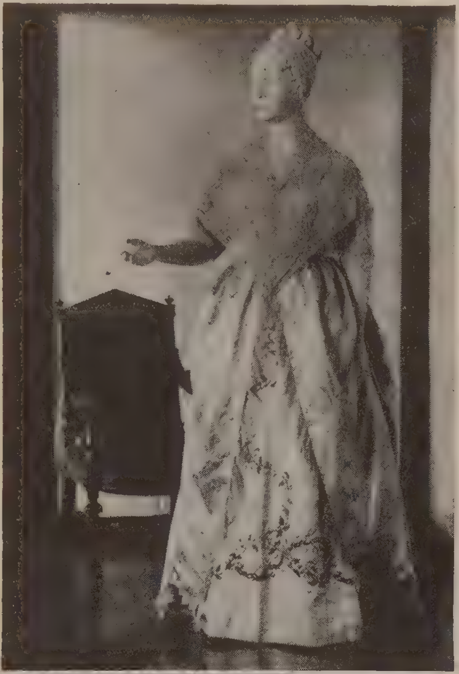
When Abigail Smith, the daughter of a New England clergyman of good old Puritan stock, married John Adams, a young lawyer without a practice, no one suspected that she was wedding the future president of the United States. Indeed, her father's parishioners were outspoken in their sentiments regarding what they termed "the mighty poor union" of their minister's daughter. It is said that Mr. Smith pointedly referred to their opposition in a sermon on the text, "For John came neither eating nor drinking, and ye say, he hath a devil."

In truth, her married life was one that called for the exercise of all the fortitude of her cheery young soul. The times in which she lived were rough and troubled ones for women. The Revolution, opening with the rattle of musketry at Lexington, called the best and bravest of the nation to fight its battles; and, without the quiver of an eyelash, Mrs. Adams saw her husband risk his head in opposition to the British government. With her brood of little ones, and a few faithful servants, she faced the dangers of the time. The British soldiers were not feared so much as the Tories and the Indians.

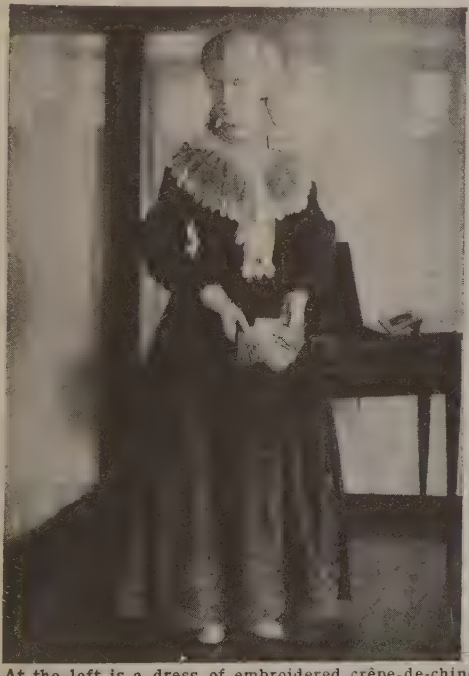
"In case of real danger, fly to the woods, with the children," her anxious husband wrote her, and bearing this counsel ever in mind, she went about her daily tasks with an undismayed heart and a cool head, determined to lay down her life for her little ones, if it should be necessary. To add to her cares, pestilence broke out in the neighborhood and entered her home. Although weak herself from a recent

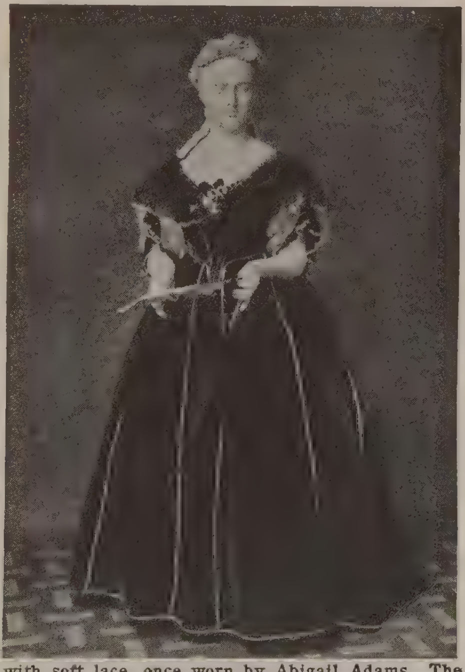
SOME COSTUMES THE FAMOUS LADIES WORE





These are not portraits of the presidents' wives, nor is there any attempt at showing likeness to the ladies' features in the heads of these figures. But the dresses are some once actually worn by the "first ladies of the land." On the left is a hand-painted salmon-pink silk that belonged to Martha Washington; on the right, a brocaded yellow satin once worn by Dolly Madison.





At the left is a dress of embroidered crêpe-de-chine with soft lace, once worn by Abigail Adams. The right-hand costume was one of Mary Todd Lincoln's and is made of purple velvet, trimmed with pipings. All these dresses are part of an exhibit of costumes worn by the wives of the presidents in the Smithsonian Institution at Washington.

Photos, Wide World Photos.

illness, the plucky woman turned her home into a hospital and gave all her energy to the nursing of the stricken ones. But through it all she found time to send messages of cheer and courage to the husband who was working for his home and land. "I am distressed, but not dismayed," she wrote cheerily to the absent head of the household; and he rested secure in the strength and cool judgment of the little woman who stood guard over all he loved and cherished.

Before the war was over and peace had settled once more upon the country, Mr. Adams returned to his family for a time; but he was obliged to leave them again to go to France as commissioner for the United States, and later to England as minister. As soon as it became possible Mrs. Adams joined her husband in London, and there her simplicity and refinement of manner gained her many friends. In 1789 Mr. Adams was elected vice-president, and on March 4, 1797, he became the chief executive of the United States.

In every way, Mrs. Adams' sense and energy proved a blessing to her husband in his new position. Her grandson writes:—"That her opinion, even upon public affairs, had at all times great weight with her husband is unquestionably true, for he frequently marked upon her letters his testimony of their good sense." When John Adams first became president the capital was at Philadelphia, but just at the end of his administration it was removed to Washington. The "President's House" was not completed, but in 1801 Mrs. Adams held the first New Year's reception. The completed portion of the mansion was but partially furnished, and the oval room upstairs, now the library, was used by Mrs. Adams as a drawing-room. It is said that clothes-lines were strung in one of the unfinished public rooms. Only four months of her life were spent in the Executive Mansion, yet she stamped it forever with her individuality. The picture of the first mistress of the White House stands vividly before us—a wiry little figure with the piquant face and snapping eyes, framed in a cap of exquisite lace. In the midst of war, desolation, pestilence and famine, her buoyant spirit never forsook her. She never spared herself in any way when the good of others lay in the balance; and this self-sacrificing woman well deserves to be remembered for her heroism and simple dignity of soul. Her children always remembered her strong qualities of mind and heart.

DOLLY MADISON, THE BELLE OF WASHINGTON

The name of Dorothy Payne Madison, commonly known as "Dolly Madison," brings pleasant associations to our minds. She was the widow of John Todd, a Philadelphia lawyer, to whom she had been married while very young, and who soon died and left her with an infant son. When she first entered Washington society as the wife of the secretary of state, political feuds ran high and party spirit embittered many social relations. Mrs. Madison's beauty and charm, however, soon won her the devotion of all parties, and politicians put aside their quarrels to meet around her hospitable board. Her house became a centre of Washington society. Her cordial manners and winsomeness disarmed all criticism.

In 1808 Mr. Madison was elected president, and Mrs. Madison gave all the strength of her nature to winning over her husband's political enemies as friends. In a buxom way, she was a beauty, and the sole aim of her life was to be popular and to help to render her husband's administration a success. She possessed the social charm her husband lacked. Every one liked her, no one could feel unkindly toward her.

The most important event in President Madison's administration occurred in his second term, when war was declared against Great Britain. In August, 1814, the British army landed on the coast and made a quick march to the capital. The President and his cabinet retired to Virginia; but Mrs. Madison remained behind in the presidential mansion, shudderingly straining her ears for the sound of the cannon at Bladensburg. A carriage was ready at the door, filled with household silver and government papers, and the President's wife waited only for her husband's instructions. At length a messenger arrived bearing a scribbled note from the President, and Mrs. Madison prepared to fly from the city. As she was about to depart her eye fell upon the portrait of George Washington. She tore the picture from the wall, and ripped the canvas from its place. "Take care of that," she cried to some friends, "but destroy it before you let it fall into the hands of the British," and with that she was gone. The portrait was saved and is still one of the treasures of the White House.

A little later the British officers entered the White House, to find the place just deserted by the servants, the dining-table spread for forty guests, and in the kitchen a dinner steaming hot over the fire. But this did not save the city, and the President's house and other public buildings were burned, as we may read on page 1705. Only the walls of the mansion were left standing. The house was rebuilt, and the walls were painted to cover the marks of the flames. This seems to be the reason why the building is now called the "White House."

The first White House, built in 1800.

At the close of Madison's second administration he withdrew from public life and spent the remainder of his years at Montpelier, in Virginia, where his wife gave him her untiring care until his death. She had given up the gay life of the capital with regret, and upon the loss of her husband she returned to Washington, where she spent the last twelve years of her life, loved and admired to the very last. Her house was the gathering-place of all the well-known persons at the capital, of the young and gay, as well as of the more mature. When she died, the multitude of people who gathered around her grave to do honor to the dead testified to the sincere affection she had won from rich and poor alike.

MARY TODD LINCOLN, THE WIFE OF A GREAT MAN

Abraham Lincoln was one of the greatest men America has produced, and naturally we must be interested in his wife. We are told that his first love, Ann Rutledge, died, to his great grief. After a time, in 1842, he married Mary Todd, a young woman of a Kentucky family, who had enjoyed greater social and educational advantages than had fallen to him. The marriage, however, was not a perfect union. Mrs. Lincoln loved her husband, and shared his devotion to their four sons, but she was never quite in sympathy with her great husband's views of life. More unfortunate still, she was not able to keep up with the growth of his wonderful mind.

He always treated her with the greatest thoughtfulness and consideration. At the time of his election to the presidency, she was the first person of whom he thought as soon as the returns indicated his election. "There is a little woman on Eighth Street who has some interest in the matter," he explained to some friends, as he excused himself and hurried off to his home with the news.

Mrs. Lincoln was much delighted at his election. She had always believed that the awkward lawyer was to succeed and now her great ambition was realized —she was to be the wife of a president, the mistress of the Executive Mansion. Her appearance and manners created a most favorable impression upon the people at the first levee held during the new administration, but unfortunately Mrs. Lincoln could not win or hold many friends. Ambitious and eager to be a social success, but without tact, she soon succeeded in offending many of those with whom she came in contact. She did not strive to help her husband, as Mrs. Madison had done with such great success. While her husband was bending under a burden of national cares that were almost too great for him to bear alone, she was thoughtless enough to bestow her favor upon some of those who were his political enemies, and to withhold it from the wives and daughters of his friends.

The summers during the war were filled with a terrible strain of public affairs. The man who was toiling to bring the nation to freedom and peace sometimes became sad and weary and dispirited. His wife did not seem to realize the heavy burdens he was compelled to bear, and the society at Saratoga and Long Branch occupied much of her thought and mind. It would seem that she never understood the greatness of the man she had married.

MRS. FRANCES FOLSOM CLEVELAND THE BRIDE OF THE WHITE HOUSE

Now we come to the last of the famous mistresses of the White House of whom we are to speak, Frances Folsom Cleveland, the most beloved of the ladies of the White House since the times of Dolly Madison. Born in 1864, she grew to girlhood in the city of Buffalo, and as soon as she was prepared, entered Wells College, of which she is now one of the trustees. Here her unaffected charm of manner and the sweet wholesomeness of her character soon made her one of the most popular girls in that institution.

Upon the death of her father in 1875, little Miss Folsom had passed under the guardianship of Mr. Folsom's law partner, Mr. Grover Cleveland. In constant association with this charming young American girl, Mr. Cleveland watched the unfolding of her character with a deep interest and admiration. In 1885 he became president of the United States; and June 2, 1886, he married his ward, who had flowered into a charming specimen of young American womanhood. The ceremony was performed in the White House. Several marriages had taken place within its walls, but no president had ever before been married there. Mrs. Cleveland was well fitted to fill the position to which she was raised. With a wonderful gentleness and tact, she delighted and charmed all who met her, and was soon universally loved and admired.

The position of hostess of the nation has its peculiar difficulties, which demand all the tact of a clever woman. Mrs. Cleveland tells one laughable story of an incident that caused her much embarrassment at the time. Adelina Patti, the famous singer, whom your parents perhaps remember, was visiting the United States and went to the White House to call upon the President's wife. They chatted together very pleasantly, but hour after hour passed, until even Mrs. Cleveland, the most cordial of hostesses, began to think that it was time for her guest to depart. Her guest seemed to think so too, but still she did not go. Finally it came out that, being accustomed to the etiquette of foreign courts, Patti was expecting to be dismissed. Mrs. Cleveland, who did not in the least think of herself as a queen, was courteously waiting for her guest to give the signal of departure.

Mrs. Cleveland was not only a charming woman, but also a wise and affectionate mother. Five children were born to the Clevelands, and one, the second daughter, Esther, has the distinction of being the first baby to see the light within the walls of the White House.

At the close of Mr. Cleveland's second term he retired with his family to Princeton, New Jersey; and from then until the day of his death, Mrs. Cleveland seldom left her husband's side. Though deeply absorbed in her home life, Mrs. Cleveland found time to identify herself vitally with all the broader interests of the Princeton community. Through all her varied experiences she has retained that sweetness of nature which constituted her greatest charm. Mr. Cleveland died in 1908, and in 1913 Mrs. Cleveland became the wife of Professor Thomas J. Preston of Wells College, which she had attended when a girl, and in which she still takes great interest.

THE NEXT STORY OF THE UNITED STATES IS ON PAGE 543.

Robin Hood's charity.

Robin Hood as a potter.

Robin Hood as a beggar.

ROBIN HOOD AND HIS MERRY MEN

CONTINUED FROM 151

ONE day, when Richard Cœur de Lion was king of England, there walked in the beautiful green forest of Sherwood a handsome youth and a beautiful maid who were lovers plighted to be wed. The youth was Robert, son of the Earl of Huntingdon; the maid was Marian, daughter of the Earl of Fitzwalter. They both loved the greenwood; they both shot exceedingly well with the bow; and the maid was as swift to mount and ride a horse as was the handsome youth at her side. As they walked hand in hand down the green glades of the forest Robert spoke of the merry days that lay before them, and Marian laughed to think of the great joy that was coming to her. They were happy lovers, a boy and a girl who thought of life as a delightful summer ballad.

But a terrible thing happened. The King was in Palestine, and his wretched brother, John Lackland, ruled the kingdom. He oppressed those who opposed him, and among those whom he ruined was the Earl of Huntingdon. Poor, brave, happy Robert saw in a single day his father killed, his home destroyed, his estates seized, and himself made a homeless and beggared outlaw.

He escaped from the soldiers of John, and plunging into the thick forest of Sherwood, with his bow, threw himself down upon the green earth and wept for the ruin that had so suddenly overtaken him.

When morning came, he took counsel with himself and planned how he should live his life. The night in the open air had been sweet to him; the sunrise breaking and glittering through the fragrant branches had roused him in the first flush of dawn; he drew the scented cool air into his lungs, felt the glory of the day caress him, and saw that the greenwood was a fair world.

"Since John has made an outlaw of me," he said, "I shall take this good forest for my estate. I shall feed upon the King's venison, and call myself Robin of Sherwood."

He wrote a sad letter to Maid Marian telling her of all his misfortunes and setting her free of her vow, since he could not ask a great lady to share an outlaw's life in the forest. It cost him many a sigh to send this letter. It was hard for him to give up his happiness, and he felt sad and lonely in the depths of the great deep wood. But his solitude was soon broken.

Brave men who had served his father, the Earl, came into the forest with their bows and arrows and swore that they would spend their days with Robin. They refused to live under the Normans; they would be outlaws, they said—free, merry men of the greenwood, and Robin should be their king. And they lived in the forest near Nottingham, which Robin sometimes visited disguised as a beggar or tradesman.

Thus it happened that Robin became the chief of a band of stout English who feared no danger, courted adventure as a maid and loved a jest. This company soon arranged how they should live. In those days, when roads were hard to find, people traveled on horseback, and many a plump abbot and covetous merchant went by the forest with their saddle-bags stuffed with gold. Robin declared that he saw no wrong in relieving these people of their baggage, since they only lived to rob the poor; he would treat them with kindness, he said, but he would help himself to their money. Disguised as a friar one day, for instance, he despoiled two fat monks of their money-bags, and kept them on their knees praying for two hours. As for the poor and needy, no man of his must lay a finger upon them; nay, out of the spoil wrung from the rich they must help these poor and make them glad and happy.

"You shall be sworn," said bold Robin Hood,
"Upon this holy grass,
That you will never tell lies again,
Which way soever you pass."

Once Robin played an amusing trick on a tinker who said he had the King's warrant to arrest the famous outlaw. Robin told him he would find him in Nottingham and offered to help him. When they came to the town he gave him so much ale that he fell asleep, and Robin walked off and left the tinker to pay the bill.

In this way Robin lived cheerfully. His fame spread through all the country. People whom he stopped and robbed told strange stories of how they had been carried far into the forest, treated to a feast worthy of a king, used with all courtesy and kindness, and after having "paid for the entertainment" had been pleasantly led forth and set upon their road again.

They told how Robin dressed all his men in suits of Lincoln green; and how these cheerful fellows sang the old English ballads and made great sport with the bow; and how one of their members called Little John was seven feet tall, another a very small and squat man named Much, and a jovial fat priest of the Church named Friar Tuck, and how Robert was called not Robin of Sherwood, but Robin Hood, and was like a king among his merry men. No wonder that, as these stories spread about the world, the Sheriff of Nottingham felt that he must catch Master Robin and hang him for a rascally outlaw not fit to live.

The outlaws, however, ran great risks, and Little John even became a servant in the house of the Sheriff himself, where he played several tricks on a greedy old butler, finally knocking him over and running off to the forest with the silver plate of the Sheriff. Some time after, the outlaws ventured into the town again to compete in an archery contest held by the Sheriff for a silver arrow. Robin won the prize, but the Sheriff tried to arrest him, and in the strife that ensued Little John was wounded, and the outlaws escaped only with great difficulty, little Much bearing big Little John for some distance on his back.

As Robin rode through the forest one day he came upon a young knight and challenged him. They fought together, and the knight was wounded. Then Robin, like a true man, knelt beside him to give him aid, but when the poor youth removed his helmet, lo, it was no knight! It was Maid Marian. Robin cried out with grief for having wounded her; but when he saw that the wound was not deep, and learned that Marian had come in search of him, he was glad, and embracing her most tenderly, he led her to the Trysting Tree. Here he blew upon his horn; his men came from every part of the forest, and when they had heard the story, they offered obedience to Maid Marian as their queen, and jolly old

Friar Tuck came rolling up with his book under his arm and married Robin to Maid Marian there in the glades of the forest, with the birds making music.

One day Robin stopped an unhappy youth named Allan-a-Dale, and learned that, after waiting long for the beautiful woman who loved him, her wretched, miserly old father had promised her in marriage to an ancient, hideous, but rich man old enough to be her grandfather. The marriage was to take place on the morrow, and poor Allan-a-Dale was broken-hearted. Robin bade him cheer up, and on the morrow he set off for the church, with his merry men following behind, and in the midst of the ceremony stopped the Bishop of Hereford, who was reading the service, and blowing upon his horn, summoned all his merry men, with Allan-a-Dale and Friar Tuck in their midst.

He gave the butler such a rap
His back nigh went in two,
Though he lived an hundred winters
The worse for it he would go.

"This bridegroom is too old," said Robin Hood; and then, addressing the bride, he said, "Lady, look round and see if you cannot find one more to your choice."

Of course she chose Allan-a-Dale, and then and there Friar Tuck married them.

On another occasion Robin exchanged clothes with a potter, took his cartload of pots and sold them in the market place at Nottingham; and on yet another occasion he stopped a butcher who was riding with panniers of meat into the market, and, changing clothes with him, set out for the very town where the Sheriff lived who had sworn to lay him by the heels. The streets were crowded, and Robin amazed everybody by selling his best beef at only twopence a pound.

So while the tinker fell asleep,
Robin made haste away,
And left the tinker in the lurch
For the great shot to pay.

The Sheriff heard of this strange young butcher and his doings, and at the market feast seated him at his side.

"I shall get money out of such a simpleton," thought the Sheriff, who was a miser. Robin could scarcely help laughing to find himself sitting in the place of honor beside his great enemy. The Sheriff asked if Robin had a big farm.

"Hundreds of acres," answered Robin, smiling to himself.

"And much cattle?"

"Hundreds and hundreds of the finest horned cattle."

"Do not speak so loud," mumbled the cunning old Sheriff; "but tell me how much you would take for your acres and cattle!"

"Three hundred pounds," said Robin.

The Sheriff arranged to ride out very early next morning with this very silly young butcher. They rode on till they approached Sherwood Forest.

"A bad man lives here," said the Sheriff. "Do you think we shall meet him? Robin Hood is his name."

"Oh, I am sure we shall not!" answered Robin, laughing.

Just then a hundred head of good fat deer passed in front of them.

"There go my horned cattle," laughed Robin. "What do you think of them? Are they not good?"

The Sheriff rode back to Nottingham late that night without a farm, or cattle, or the three hundred pounds (fifteen hundred dollars) which he had brought with him for their purchase from the simple butcher.

Another of Robin's enemies was the Bishop of Hereford, who had never forgiven Robin the matter of Allan-a-Dale's marriage. He came riding into Sher-

The butcher he answer'd jolly Robin,
"No matter where I dwell;
For a butcher I am, and to Nottingham
I am going, my flesh to sell."

Up he took him on his back,
And bare him well a mile,
Many a time he laid him down,
And shot another while.

One of his best arrows under his belt
At the friar he let fly;
The curtal friar, with his steel buckler
Did put that arrow by.

wood Forest one bright summer day with a company of soldiers carrying money to a distant monastery. He hoped to capture Robin on his way and carry him prisoner to the Sheriff of Nottingham. As luck would have it, Robin was straying alone about the forest that day, listening to the blackbirds and thrushes, and enjoying the sweet scents of briar-rose, honeysuckle and bracken.

Before he was aware of them, the Bishop's soldiers saw him and charged down upon him. Robin took to his heels. He dodged behind trees, crept along ditches, and ran down the narrowest glades. The horses of the soldiers tripped and stumbled, throwing their riders to the ground. Robin ran hard till he reached the cottage of a poor woman. He changed clothes with her, and promised that if she remained still and let the Bishop capture her, no harm of any kind whatever should befall her.

As soon as she knew that she could serve Robin Hood, and do a bad turn to the wicked Bishop, who oppressed the poor, the old woman was glad. So Robin hobbled off, and the soldiers took no notice of him; but they went into the cottage, captured the dame in Robin's Lincoln green, and carried her away. Not very far had they gone, however, before Robin stood in their way with all his bowmen ranged on every side of them. The soldiers laid down their arms, and the Bishop had to deliver up all his treasure.

"It belongs to the Monastery of St. Mary," said the Bishop.

"Nay," answered Robin; "it belongs to the poor, from whom you have filched it, and to whom it shall now return."

Then he made the Bishop celebrate High Mass; and all his men praised God among the trees in the forest.

On one occasion Robin lent a poor knight a sum of four hundred pounds (two thousand dollars) wherewith to pay a selfish abbot who had lent it to him. The knight arrived at the abbey only just in time, and found the abbot laughing and eating heartily in company with a justice of the peace whom he had invited to dine with him and arrange for the transfer of the knight's broad acres to the abbey.

The knight, to the abbot's disgust, paid up the four hundred pounds, upbraided him for his greed, and rode away home, blessing the kindness of Robin Hood.

A stout and long encounter, too, had Robin with giant Friar Christopher, of Fountains Abbey. He shot all his arrows at him, but the friar stopped them all with his shield, and they then fought hard with swords until they became great friends, and the friar went off with Robin Hood and his merry men into the greenwood.

Such stories as these came to the ear of King Richard when he returned from the Holy Land, and he determined to see Robin Hood. But though he rode many times in Sherwood Forest he saw nothing of Robin or his merry men. He was then advised to put on the dress of a monk, and so disguised, he traveled through the forest, and Robin seized him, though the King gave him a blow that sent him sprawling on the ground. The King was treated fairly, and given a feast, and in the midst of it he showed his ring to Robin, and said that, though a monk, he was a messenger of the King. At the name Robin and all his men stood up, uncovered, and cried with one voice: "God save King Richard!"

The King then disclosed himself, and Robin knelt and kissed his hand. So pleased was the King with this loyalty, and so struck was he by Robin's kindness, that he gave him a free pardon. Robin and his merry men followed the King to London, and there they feasted and had great cheer.

But when Richard died, and John succeeded to the throne, Robin and his merry men had to fly once more to the forest. They were not very sorry, for they loved the wild life of the greenwood, and they were not afraid of John while they had the familiar forest for a kingdom of their own.

The years passed, and Robin grew very ill, and when he watched the young men shoot he grew very sad at heart. He said he thought he would go and visit his relative, the Abbess of Kirkley, in Yorkshire. Little John, very much grieved at his master's sickness, bore him thither. He wanted to be near his master and nurse him; but the Abbess would not hear of this, and bade him wait in the garden. Then she made a wound in Robin's arm to bleed him, but, instead of tightly bandaging the wound, this woman, who in her heart hated Robin for his robberies of monks and priors, loosely knotted the linen, and went out, locking the door behind her. So Robin lay alone bleeding to death, and the faithful Little John stayed in the garden of the abbey gazing up at his beloved master's window.

Twilight fell upon the garden. Presently three soft notes sounded faintly upon Robin's horn.

"He must be dying to blow so weakly!" cried Little John, and started up. He ran up the stairs, reached the door, burst it open, and rushed in to embrace his master.

"I am dying," said Robin, and swooned in his arms.

He took him to a board anon,
To a table round,
And then he shook out of a bag
Even four hundred pound.

And such a buffet he gave Robin,
To ground he went full near;
"I do avow to Heaven," said Robin.
"Thou art a stalwart frere."

Robin saw some young men shoot,
Full fair upon a day,
"Alas, alas," said good Robin,
"My joy is gone away."

After a moment he roused himself. "Give me my good bow and an arrow," he said. He took the bow and went to the window. "I will shoot once more," he said, "and where the arrow falls, there let me be buried."

He was so weak that the arrow sped weakly forth and fell but a little way into the ground.

"A good shot! A good shot!" cried Little John, with his eyes full of tears.

"Was it a good shot?" demanded Robin, eagerly. "Really a good shot?"

"'Twas a good shot, master."

Then Robin said:

Lay me a green sod under my head,
  And another at my feet,
And lay my bent bow by my side,
  Which was my music sweet;
And make my grave of gravel and green,
  Which is most right and meet.

Let me have length and breadth enough,
  With a green sod at my head,
That they may say when I am dead,
  Here lies bold Robin Hood.

As he lay swooning in the arms of Little John he suddenly roused himself, and looked earnestly forth from the priory window toward the gathering darkness of the night.

"Was it," he whispered hoarsely, straining his eyes, while his heart throbbed and shook his frame, and his soul passed away—"was it really a good shot?"

A PAIR OF MAGIC SLIPPERS

IN the old coaching days, when everybody traveled by road, the inn-keepers were a race of busy men. Certainly Sandro Reni, who kept an inn on the highway between Siena and Florence, was the busiest man in Italy. His inn was always crowded with travelers, and all the work fell on his shoulders. His wife died, leaving him a little daughter named Nina; and as he found that he could not get on without a helpmate, Sandro married again.

Little help, however, did he get from his new wife. She was a very beautiful creature, but she was as idle and as vain as she was beautiful. And, unhappily, the fame of her great beauty spread far and wide, and this made her still idler and more vain.

Whenever travelers came to the inn, she used to show herself off, and say: "Have you ever seen anybody more beautiful than I?"

At first they replied that they had not; but at last, as Nina grew up, and became also very lovely, they said: "Well, your little stepdaughter, you know, is undoubtedly a very charming girl."

By this time, however, the woman's head had been turned by all the admiration she had obtained, and she could not bear to hear praise given to anyone but herself. She looked with spiteful and angry eyes at Nina, and said to herself: "If I do not get that child out of the way, I shall lose all my fame."

She had received a great many jewels from her admirers, and she now sold half of these, gave all the money to two wicked and desperate men and told them to take Nina to a distant forest and kill her, and bury her there.

The two men carried Nina to the forest; but they were so touched by her innocence and beauty that they had not the heart to shed her blood, so they tied her to a tree and left her to starve.

There Nina remained for five days and four nights, but on the fifth night, just as all her strength was failing, a band of robbers gathered beneath the tree to share their spoils.

"Oh, great heaven!" cried the captain of the robbers, as the light of their fire fell upon the white dress of Nina. "An angel is watching us!"

The robbers fell upon their faces. Then, finding that the white figure did not move, the captain crept slowly up, and touched it.

"Why, it is a beautiful girl!" he exclaimed. "Quick, cut the ropes! She is dying!"

The robbers took Nina to their cave and kindly tended her, and when she recovered she told them her story.

"Well," said the captain of the robbers, "I think that it would not be wise for you to return home. Your stepmother would find some other way to kill you. Stay with us and be our little housekeeper."

And this was what Nina did. She kept house for the robbers in the cave and prepared their meals for them. In return they treated her as a little sister, and whenever they went to sell their spoils at Florence or Siena, they brought her jewels and fine dresses. But one day they stopped at Reni's inn, and his wife saw one of the dresses.

"Who is that for?" she said.

"For someone more beautiful than you," said the captain of the robbers.

The stepmother at once guessed who it was. She sold the other half of her jewels, and gave all the money to a witch and bought a pair of satin slippers from her.

And the next time the captain of the robbers came, she said to him: "Here's a pretty present for the pretty girl of whom you spoke."

The captain of the robbers took the slippers to Nina, and in the afternoon, when Nina was alone, she put them on. When the robbers came home at night they found their little sister lying dead on the floor of the cave, and they could not understand how she had come by her death.

"Oh, how beautiful she is!" said the captain of the robbers. "Let us array her like a princess and make the cave her tomb."

So they made a couch in the middle of the cave and placed Nina upon it, dressed in her jewels and a lovely robe, and because they could not bear to live in the place she had lightened with her presence, they all went sadly away and dwelt in another part of the forest.

Finding that the place was no longer infested with robbers, huntsmen in search of wild game began to frequent it; and one day the young Duke of Tuscany started a boar, which ran into the cave.

"Now I have the beast," he said. And he alighted from his horse and entered the cave, and found Nina lying on the couch.

"Oh, what a miracle of beauty!" he exclaimed. "Surely she lives!"

He forgot all about his hunting and hung entranced above her couch. Then he sought to rouse her, but though he tried many ways to bring her back to life, she never moved, and at last, as night was falling, he prepared to leave.

"But I must have a keepsake," he said to himself.

He pulled off one of her slippers. Then, seeing in amazement that one of her eyes had opened, he pulled off the other slipper, and the other eye opened, and Nina rose up. In great joy the young duke clasped her in his arms, carried her to his horse, and seating her on it, led her to his palace, where his friends welcomed her warmly.

Nina opened her eyes and rose up, and the young duke clasped her in great joy.

After he heard her story, he had the stepmother and the witch and the two wicked men punished. But he pardoned the robbers and took them into his service; and when the splendid wedding of the young duke and the lovely Nina took place, Sandro Reni became quite an important man in that country as father of the duchess.

THE FAIRIES OF ST. DAVID

A LONG time ago Elidorus, a boy of twelve years of age, was punished by his schoolmaster. So he ran away and hid in a cave by the river, and there he remained without food for two days.

Two wee men then appeared, and said: "Follow us, and we will take you to the Land of Delight."

And Elidorus followed them through a dark passage in the earth, out into a rich and beautiful country. But there was no sun, no moon, no stars—only a strange twilight falling from a strange sky. The two wee men led Elidorus to their King, and their King made Elidorus companion to his eldest son. All the people of the Twilight Land were very small, but they were very handsome, and they had long golden hair that fell over their shoulders. The King of the Twilight Land allowed Elidorus to go back through the dark passage and visit his mother, and one day Elidorus told her what a rich country he lived in, and she bade him on his next visit bring her some of its treasures.

So the next time Elidorus played with the son of the King he stole a golden ball and ran with it to his mother's house. The two wee men, however, pursued him, and they tripped him up just as he got indoors, seized the golden ball from his hand and departed.

Elidorus was very sorry that he had stolen the golden ball, and he wanted to beg the King's pardon, but the passage in the cave by the riverside was closed, and was never opened again to Elidorus.

THE LORD OF THE LIONS

SOME time ago a settler in Uganda brought with him a donkey, and one morning the donkey ran away into the open country. There he brayed so long and loudly that he roused a lion. The lion sprang up, and then stood still in astonishment. Was it safe to attack this strange, new animal with long ears?

"Who are you?" he said.

"The Lord of the Lions," said the donkey. "Didn't you hear my challenge?"

"Yes," said the lion. "But we need not fight. Let us enter into a league against all other animals."

So the two of them set out together, and they came to a river. The lion cleared it at a leap, but the donkey swam through it very badly.

"Why, you can't even swim!" said the lion.

"Swim?" said the donkey. "I swim like a duck. Didn't you see I caught an enormous fish with my tail, that nearly pulled me under? But you were so impatient that I let it go."

Soon afterward they came to a wall. The lion jumped over, but the donkey got his fore feet across and couldn't get any farther.

"What are you doing now?" said the lion.

"Can't you see?" said the donkey. "I'm weighing myself. I want to find out if the fore part of my body is as heavy as the hind part."

After a wild struggle the donkey got over, and the lion said: "You've no strength at all. I shall fight you."

"Just as you please," said the donkey. "But let us first have a real trial of strength. When I'm by myself I never jump over a wall, I knock it down. Let me see you do that."

The lion began to pound away at the wall with his paws, but he bruised himself so badly that he had to stop. The donkey then kicked the stones furiously with his iron hoofs, and the old wall soon tumbled down.

"By jingo, you are strong!" said his companion, licking his wounded paws. "I will have you acclaimed Lord of the Lions."

The next day all the lions of Uganda met together, and the donkey led them with a majestic air into a valley overgrown with great prickly thistles.

"Oh, don't go there, please!" all the lions cried in terror. "The prickles will get into our paws and we shall be unable to stalk our prey."

"Well, you are timid creatures!" said the donkey. "Now, look at me."

And, to the amazement of the assembly, he began to eat up the prickly plants. He was at once acclaimed Lord of the Lions, and as he never wanted any of the game which his subjects killed for food, he pleased them more than any other ruler they had ever had.

THE NEXT STORIES ARE ON PAGE 537.

STOP, LOOK AND LISTEN!

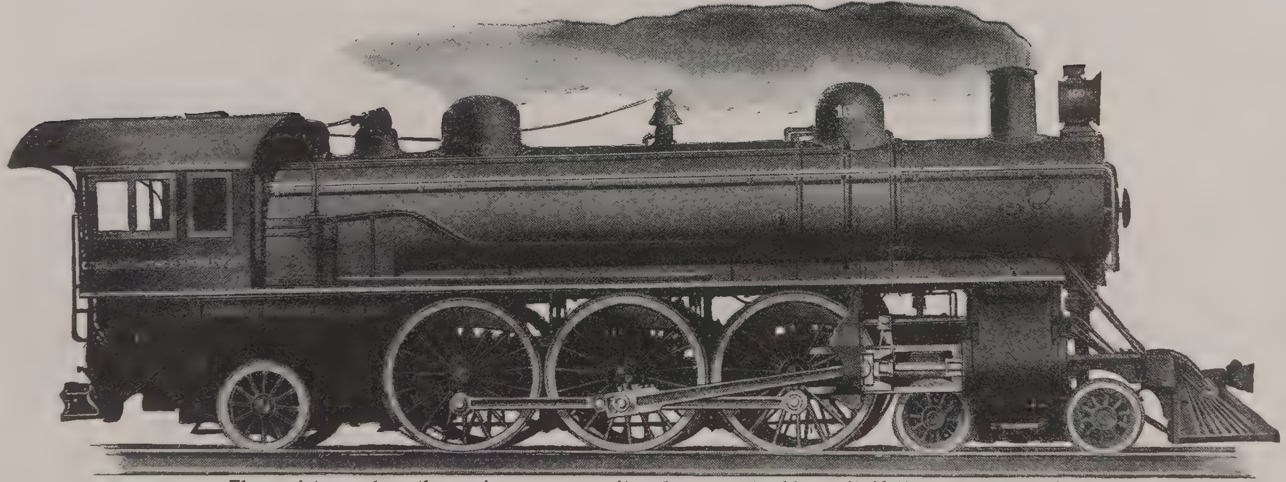
Trying to save a minute may cost a life. Everyone knows that the locomotive has the right of way over its own tracks and that a heavy train cannot be stopped at once. Yet every day we read of motor cars that have attempted to cross ahead of trains and have failed.

WHAT MAKES THE ENGINE GO?

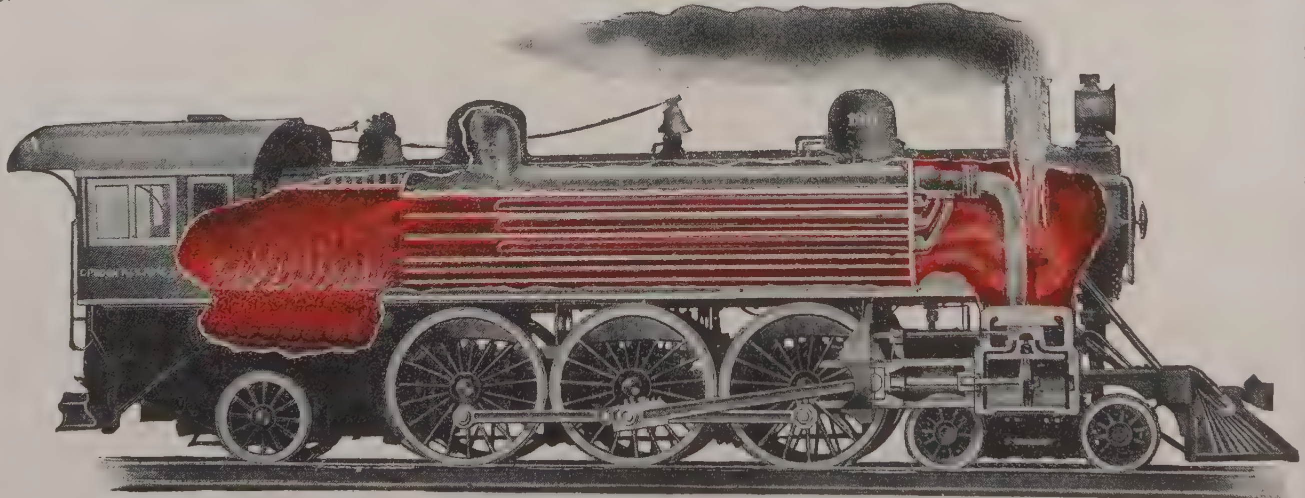
If the outside of a locomotive could be removed and we could see the machinery and parts inside, as the train went past, we would see what these pictures show us. In the first picture we see an engine as it is. This kind of locomotive is called the "Pacific type," and has three pairs of driving wheels, a four-wheel truck in front, and two trailer wheels under the cab and furnace. The other three pictures show the boiler, furnace, smoke-box and cylinders cut in half.

The locomotive moves because water heated by the fire in the furnace is changed into steam, which expands, or enlarges, so fast that it can push aside anything that can be moved. So, when it is let into one of the cylinders (which are between the two small wheels under the smoke-stack) by the valve, it pushes the rod called the piston forward, when the rear valve is open, as in the third picture, or backward, after the front valve is open, as in the fourth picture. This is what makes the engine move.

The boiler, filled with water, has a number of tubes, or flues, running from one end to the other, so that the heat and smoke from the furnace can pass through them to the smoke-box in front and escape through the smoke-stack. Whenever we see the red color we know that there is fire and heat. When the heat passes through the tubes the water becomes hot and turns into steam. This goes first into the steam-



These pictures show the engine as we see it and as we should see it if the cover were off.

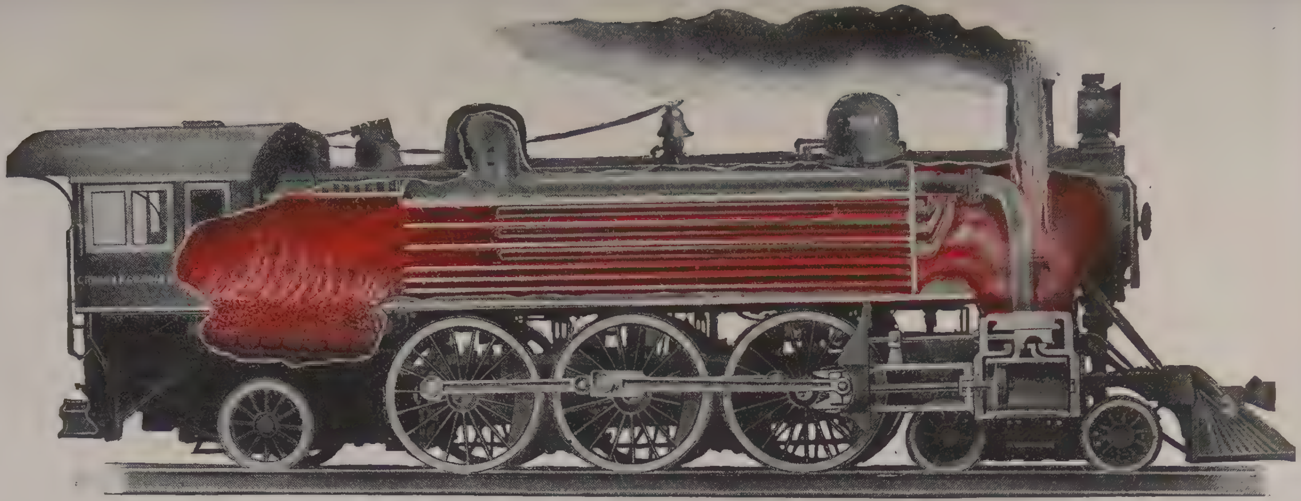


dome on top of the boiler. When the engineer opens the throttle, by pulling a lever in his cab, as the little house is called, the steam passes from the steam-dome through the pipe which we can see leading into the cylinders. In this way the steam can press on the piston and push it to the one end or the other, thus making the piston rod slide backward or forward, and turning the wheels through the connecting and crank rods.

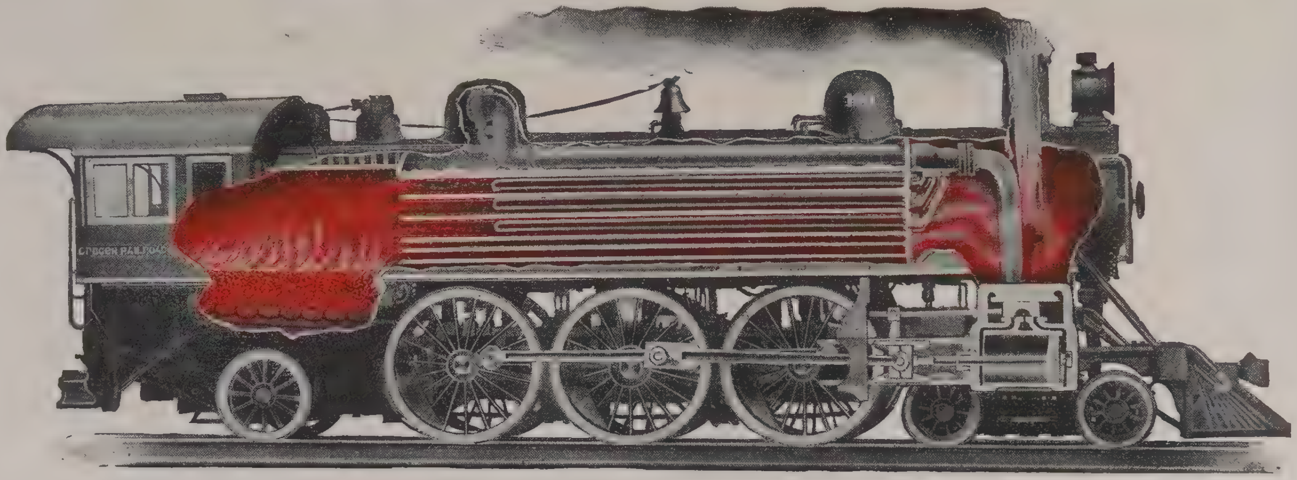
In this boiler we see also a device known as a "superheater," which consists merely of a number of tubes entering the flues from the front and bent at the rear end so as to come out again. The steam from the dome, on its way to the cylinders, passes through these tubes and is exposed to the "dry heat" from the furnace. Steam so heated expands faster and hence exerts greater power.

The steam enters the cylinder through one inlet valve and pushes the piston away to make room for its expansion. At about midway in the travel of the piston the valve is closed, as shown in the second picture, and the rest of the stroke is made by the power of the steam in the cylinder expanding still further. Picture three shows the rear valve open with the steam driving the piston forward. Picture four shows the forward stroke ended and the valve about to open to admit steam to drive the piston back again. This is the way the steam makes the locomotive move.

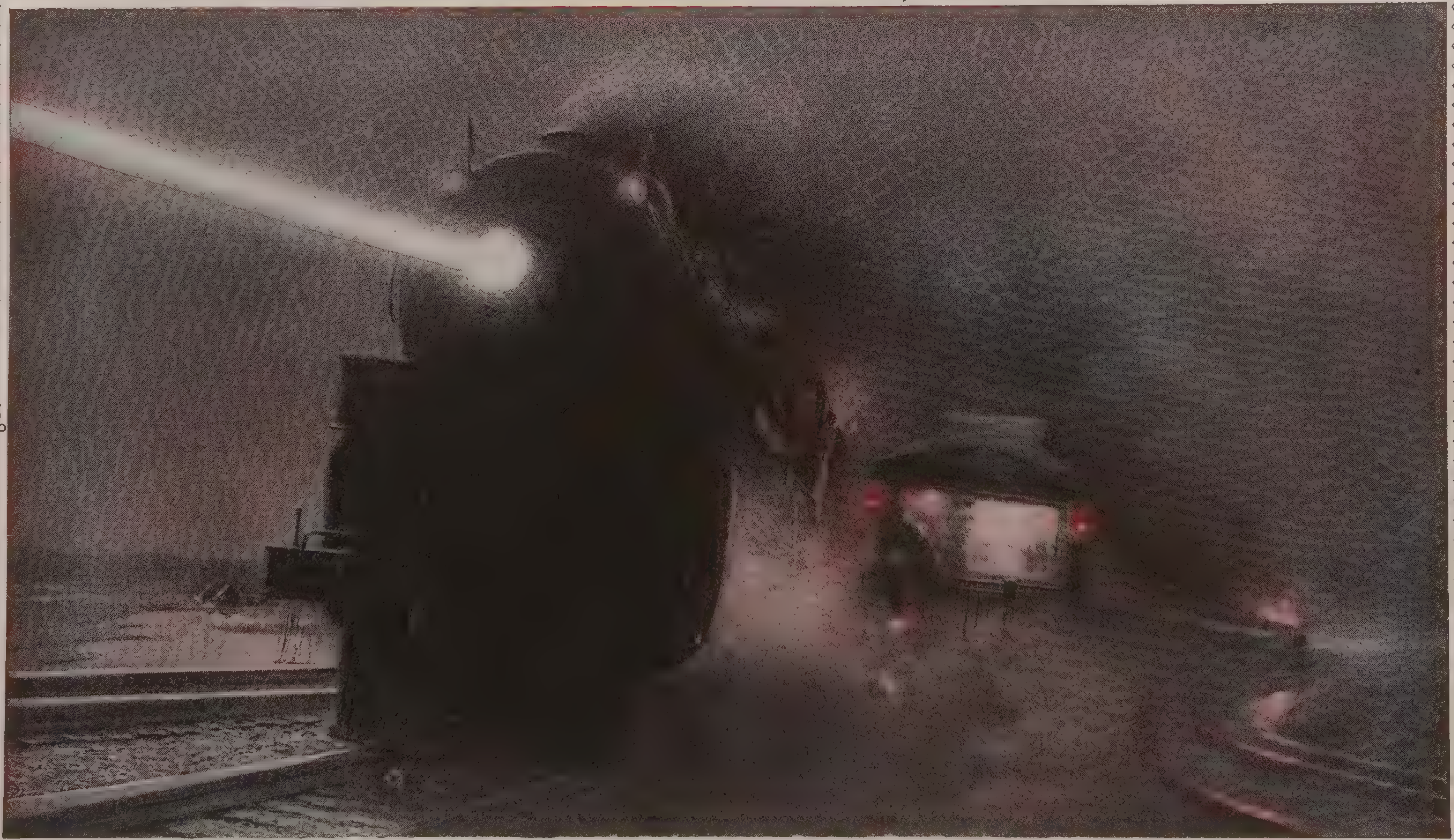
HOW FIRE AND WATER TURN THE WHEELS



These pictures show how the steam drives the piston and the piston drives the wheel.

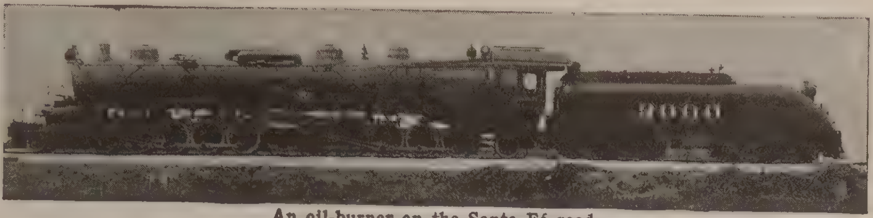


TWO EXPRESSES PASS IN THE NIGHT, EAST MEETS WEST



Pictures on pages 405 and 408 from paintings by William Harndon Foster. © New York Central Railroad Company.

This striking picture shows the Twentieth Century trains, running between New York and Chicago, at the point where they pass midway.



An oil-burner on the Santa Fé road.

THE WONDER OF A TRAIN

CONTINUED FROM 384

YOU must have stood some day in a country lane, perhaps in a quiet place far from any town, and watched a train rush past. There is really nothing in the world more thrilling to see than that, especially if it is dark and the train flies past in a flood of light, like a giant who possesses the earth. That train started from a great town; it flies through towns and villages, past fiery furnaces and smoky factories, through quiet fields where cattle are grazing and birds are singing, on into another busy town that lies ahead.

This wonder, the railway train, is one of the greatest triumphs of man. It began with a kettle steaming on the hob—with a man who started thinking for himself about the steam and wondering what could be done with it. That thinking man has changed the world for you and me, and when we go to the seaside for our holiday, or come to the city to see the sights, or go from town to town to see our friends, we owe our pleasure very largely to a man who sat by the fire a hundred years ago watching a kettle steam.

Perhaps you have not thought, when quietly sitting in a railway car, that you can be safe and happy at such a time only because thousands of men are wide awake and looking after you. It is not enough for the engineer to be always looking out; it is not enough for the fireman to keep the fires burning. If nobody did anything else than that, we should never get anywhere at all, and no railway would be safe. The men in the signal-boxes must attend to the signals. The track-walkers must see that the line is safe. The man at the grade-crossing must see that the gates are closed. The man at the points where the tracks join must see that switches are in the right position. The man who makes the time-tables must see that two trains are not at the same place on the same track at the same time. The men in the station must be ready for the train when it stops. Somebody must see that the tunnels are free, that the bridges are safe, that there are water and fuel for the engines. The engines must be carefully gone over every day and kept in perfect order. In fact, every bit of every railway must be examined every day.

And so hundreds of thousands of men are kept busy all day long, watchful every moment, listening, thinking, writing, telephoning, running, shouting, working at a hundred things, in order that we may ride comfortably in the train.

A hundred years ago there was not a single train in America, and there are still old people who have never been in a train. There are some people who have never *seen* a train. The railway is yet young, but it has grown quickly, because it is the first thing that men need when a country begins to grow. Thousands of trains are always running, carrying thousands of people to and fro; and it is a wonderful thing to think that the power which drives them is the same power that makes a violet grow. If there were no sun, there would be no trains, because there would be no fuel; and if there were no fuel, there would be no steam to drive the giant engines on their way.

We tell you of the men who made the railways and of the early days of railroading on pages 1610–18. In that story we show you some curious pictures of the engines and the railroads of the early days. Here we shall speak chiefly of the wonders of the modern railway. It does not look very much like the railway of seventy-five years ago.

SOME OF THE COMFORTS OF TRAVEL TO-DAY

The first trains were slow, uncomfortable and dangerous. The rate of speed was low, and frequent stops were made to take on wood and water. The modern train goes much faster, and the engine often takes on water while in motion. The track was flimsy, and rough, and accidents were frequent. Now the heavy steel rails make a smooth and solid path for the wheels. The old hand brakes took a long time to stop the train. The modern air brake can stop a heavy train in a very short distance. Dozens of other inventions help to make travel safer.

The modern train is rapid, comfortable, and as safe as one's own home. In some of the long-distance trains travel is made very easy. One may sit in a comfortable chair and read a book from the library, or look at the changing scene, or listen to the radio. There are barber shops and bathrooms in some trains, and a man can call a stenographer, dictate his letters and have them typed ready to be mailed at any station. He can get a good meal in the dining-car, and sleep in his berth or in a little room.

The best long-distance trains in the world are in Canada and the United States, because the distances are so great and because the people of these two great nations travel more than those of other countries. In some trains you can go from ocean to ocean without changing cars. Of course engines are changed several times on such a journey.

THE FREIGHT TRAINS WHICH WE OFTEN FORGET

When we think of trains we are likely to think of passenger trains only, but they are only a part of the work of the railroad. The freight trains are quite as important, if not more so. It requires thousands of trains, each composed of many cars, to carry the coal we burn. Other trains carry the wheat to the mills and bring the flour to the cities and towns. The meat some of us eat is brought on trains. The orange you had for breakfast may have come two thousand miles on a train. Cotton is carried to the mill, the cloth to the factory, and finally the clothes are brought to us in freight trains. Nearly every part of the house in which you live, and almost everything in it, has been brought many miles in freight cars. It would be interesting to make a list of the familiar things about you which are not produced in your neighborhood and which must be brought to you in trains. Hundreds of thousands of people you never see are helping to make life easier and more pleasant for you. The whole world is linked together, and we do not depend upon what is produced in our own neighborhood.

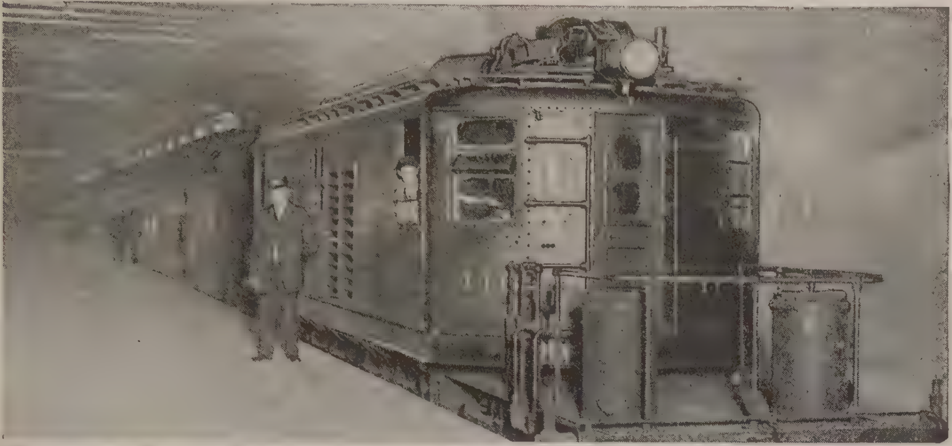
THE ELECTRIC LOCOMOTIVE AND THE MOTOR TRUCK

Though most trains are pulled by steam engines, several railroads have installed electric locomotives. When they are not used to draw all trains, electric locomotives are sometimes used to take trains in and out of cities, where the smoke would be unpleasant. All railroads entering New York City go through tunnels, and for this reason they are pulled by the cleaner electric locomotives. Formerly getting into the city was very unpleasant because of the stifling smoke in the tunnel.

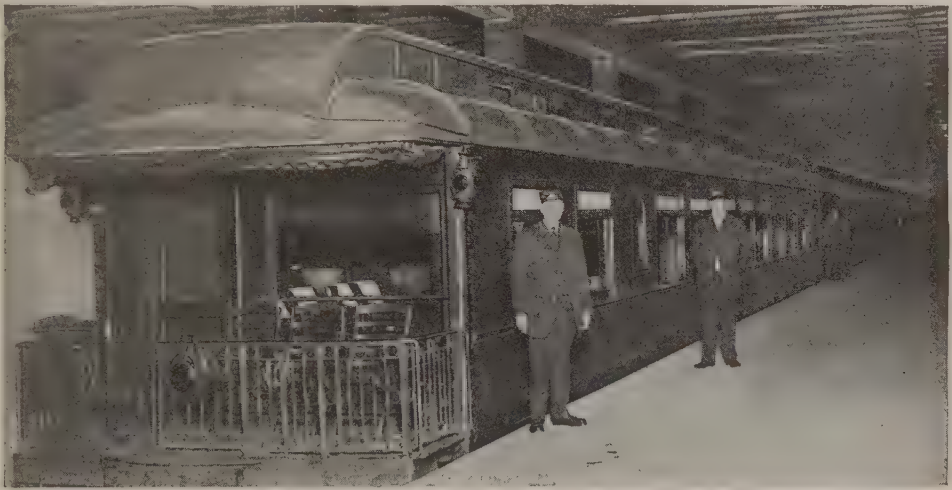
The motor car and the motor truck have become rivals of the railroad to some extent. This is chiefly for short distances. Except when going on a holiday we seldom travel long distances in a motor car. We do not often wish to ride all night sitting up, and so we must either camp or else stop at a hotel; whereas we could sleep while riding in a train. We can easily go in a train three or four times as far in twenty-four hours as we are likely to go in a car. Most of the freight carried in motor trucks is for short distances, though sometimes trucks run regularly between towns several hundreds of miles apart. In some parts of the country bus lines carry many passengers between towns.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 529.

THE TRAIN LEAVES TOWN AT NIGHT

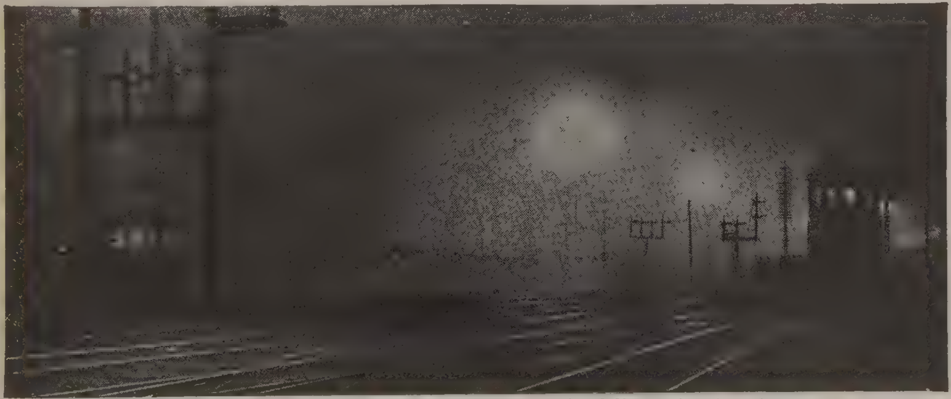


This is a train, drawn by an electric locomotive, starting at night on a long journey, perhaps several hundred miles. Many trains leave at night so that passengers, sleeping on their way, may reach their destination in the morning. A steam engine may take the place of the electric locomotive later.



Here is the other end of the long train. Ahead are the sleeping-cars, and the mail, baggage and express cars. A part of the last car is fitted up as a smoking-room, with many comfortable chairs.

Photos, courtesy of New York Central Lines.



Night-time on the railway: the great network of lines at a junction.

OVER THE WATER AND ACROSS THE VALLEY

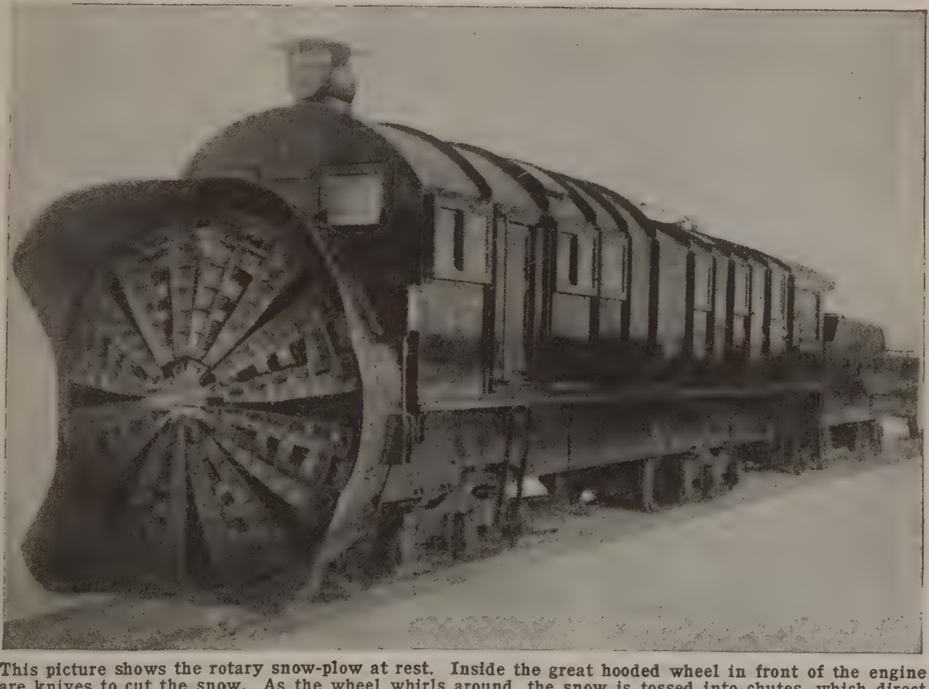
This bridge across the Delaware River is on the new line of the Delaware and Lackawanna Railroad. It is more than one-fourth of a mile long, and the rails are 115 feet above the water.

The Maria Pia bridge over the Douro River at Oporto, Portugal, the first parabolic bridge ever constructed, was built in 1877. The railway crosses the ravine at a height of two hundred feet.

The Lethbridge viaduct on the Crow's Nest Pass line of the Canadian Pacific, near Lethbridge, Alberta, is over a mile long and got rid of thirty-seven curves besides shortening the distance.

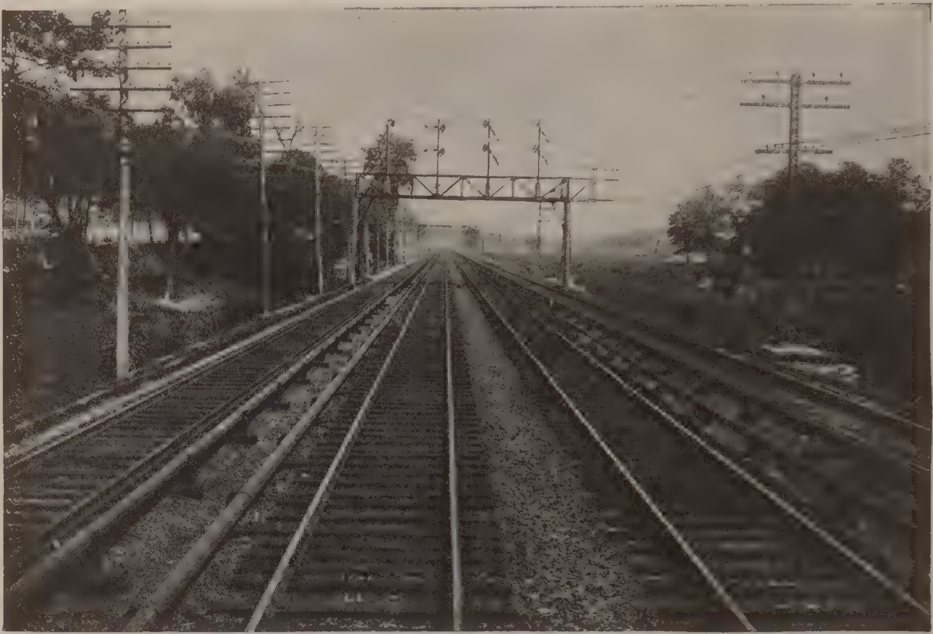
THE TRAINS FIGHT WITH THE SNOW

In some parts of our country the snow sometimes blocks the railways. Two, or even three, engines are often attached to one train. Where the drifting snow fills the cuts, a great snow-plow pushed by several engines cuts out the snow and throws it to the sides of the track. You can see in this picture the flying snow and the engines pushing behind the great plow. In some places sheds protect the tracks.

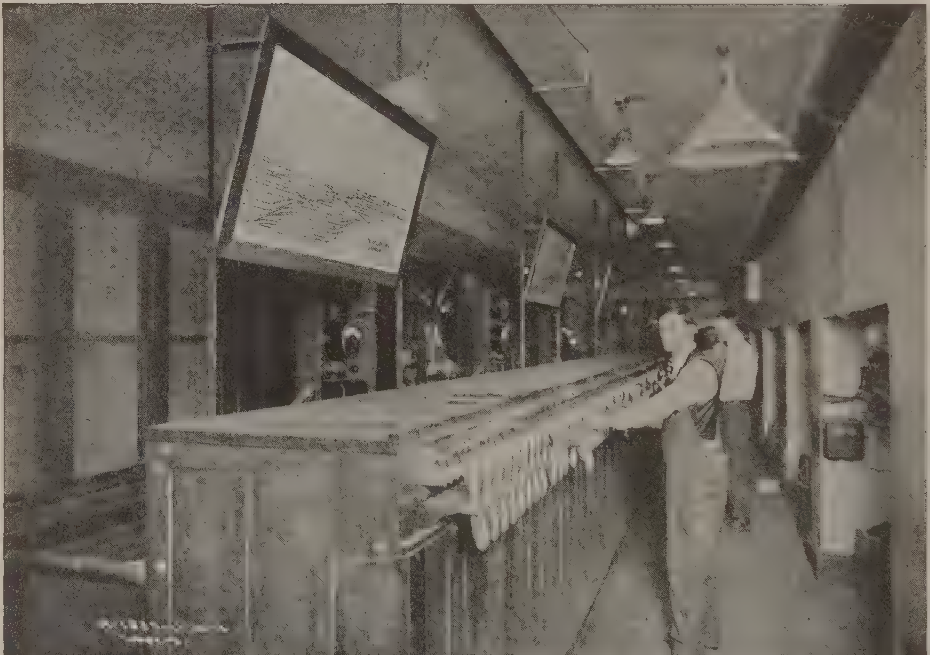


This picture shows the rotary snow-plow at rest. Inside the great hooded wheel in front of the engine are knives to cut the snow. As the wheel whirls around, the snow is tossed into chutes, which direct it upward and outward, sending it free of the track. Think of the powerful engines that can barely work through an accumulated mass of snowflakes, each by itself a frail and tiny thing.

HOW THE ENGINEER FINDS HIS WAY

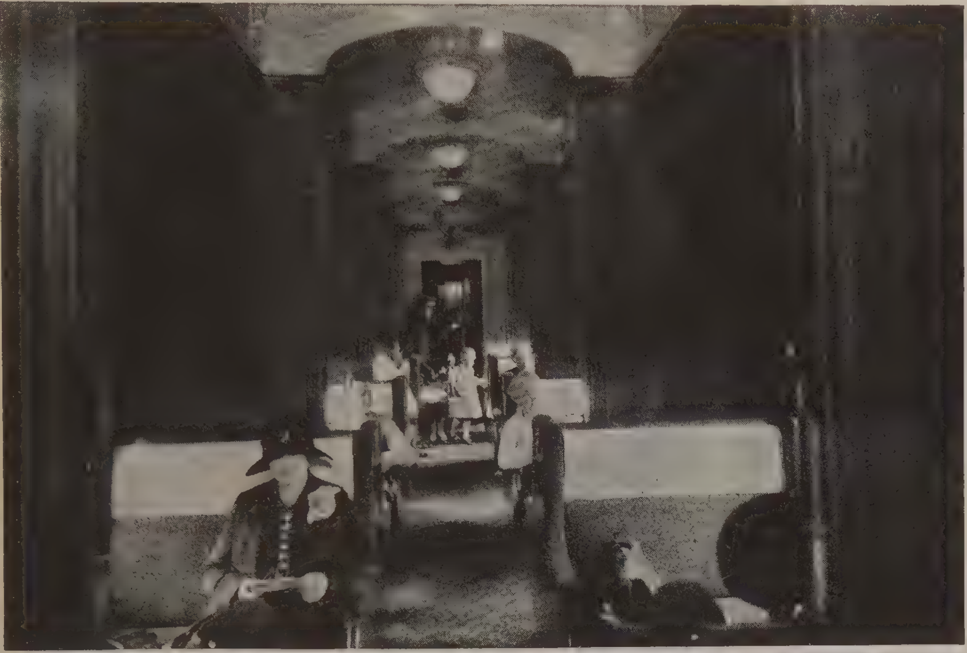


On some railroads the signals are worked by hand, but on the best lines they are set automatically. The arms stretching across the tracks are called semaphores. When the arms point down, the track is clear and the engineer may go on; when stretched straight across, another train is not far away and the engineer must stop or go slowly. At night lights of different colors show on the signal poles.

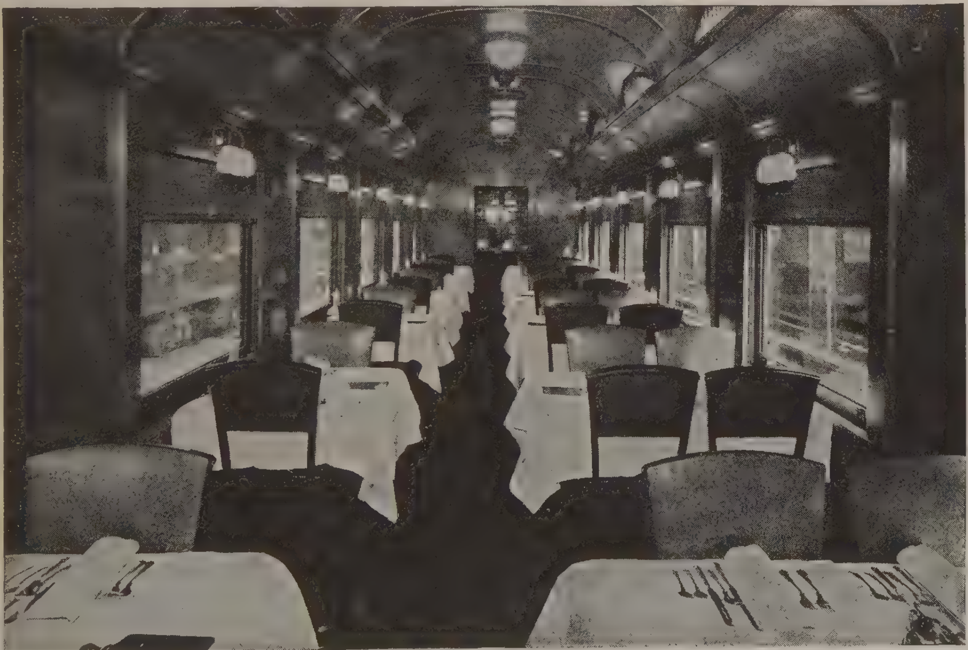


Near the great terminal the few tracks on which the many trains have come divide and spread out like the fingers of the hand. If this were not so, few trains could get into the station or out again. Here we see the men who set the switches which divide the trains, sending the first to one track, the next to another, and so on, according to the map of the tracks shown in front of them.

THE LUXURY OF MODERN TRAVEL



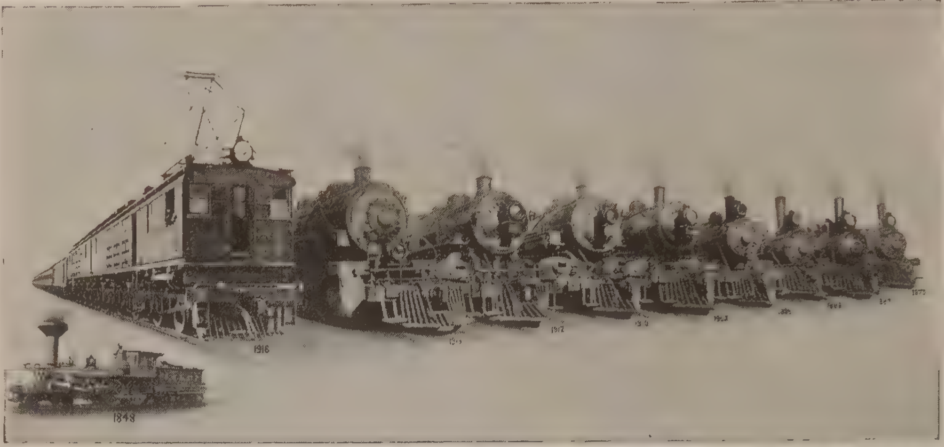
This is the latest type of Pullman sleeping-car as it appears during the day. At night the two seats facing each other are slipped forward to make a bed. The curved sides above are let down, showing an upper bed over each lower one. Walls separate the sections, and curtains are hung in front. There are, then, two beds in each section, on which travelers can sleep comfortably.



Nothing adds more to the comfort of traveling than the dining-car. A hot meal equal to that served in a good restaurant may be eaten as you are whizzing along at the rate of fifty miles an hour. A kitchen, complete in every detail but so compact as to take little space, is at the end of the car.

Upper picture, courtesy The Pullman Company; lower, courtesy The Pennsylvania Railroad.

ENGINES OF THE PAST AND OF TO-DAY



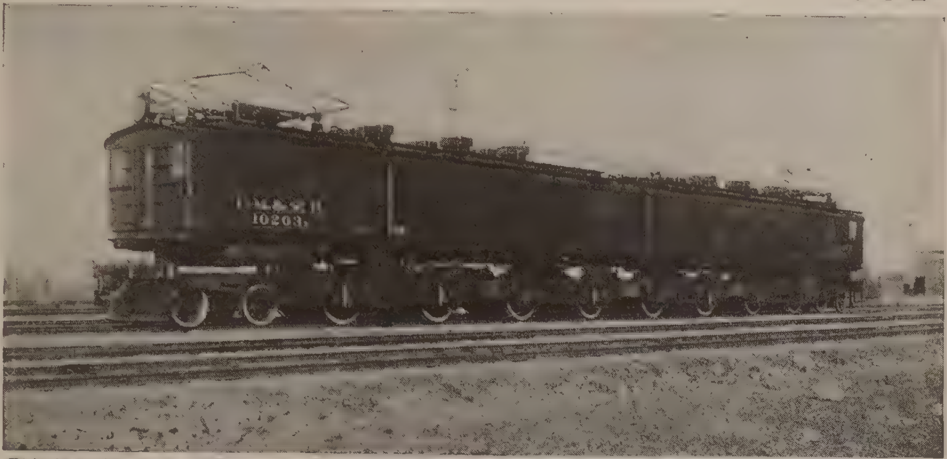
On the left is one of the mammoth electric locomotives used on the Chicago, Milwaukee & St. Paul Railway. The steam locomotives of recent years are shown to the right. In the lower left-hand corner is a locomotive of 1848. The tiny engine would be useless on a modern railroad with its heavy cars.

This is one of the enormous engines in use on the Southern Pacific Railroad. It is called a Mogul-Mallet compound, weighs 426,000 pounds, and pulls great loads at a good rate of speed. It is really two engines, both very large, joined together and under the control of one engineer. It can pull very heavy trains.

This huge freight locomotive, built at the Canadian Locomotive Works, Kingston, Ontario, has the power to draw 14,500 tons; that is, it could move 150 loaded freight cars on a level track. Its approximate length over couplers is 92 feet, 8 inches. The total weight of engine and tender in working order is 327 tons.

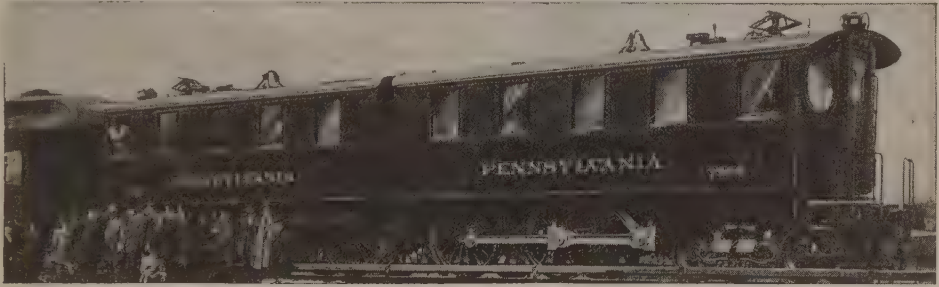
Built, like the freight engine above, at Kingston, Ontario, this type of passenger locomotive, produced in 1923, was made ten per cent more efficient than any engine previously used for passenger service in Canada, besides being more economical to operate. Locomotives of this 6000 class are used to haul passenger trains on the lines of the Central and Atlantic regions in Eastern Canada, and on the Grand Trunk Western lines in the United States.

THE IRON GIANT THAT CARRIES US ABOUT



This is a side view of the electric locomotive shown on the page facing. The Chicago, Milwaukee & St. Paul Railway was one of the first of the important railroads to use electricity as a motive power, except around stations. Such an engine with its train requires heavy rails and a solid roadbed.

After years of testing with regard to the requirements of the service, the Canadian Pacific Railway has selected the features which count most in efficiency, reliability and economy. Boiler, firebox, tube and gas areas, driving-wheels, cab and tender, even appearance—every point has been given earnest study in developing a standard locomotive like the one that is shown in this picture.

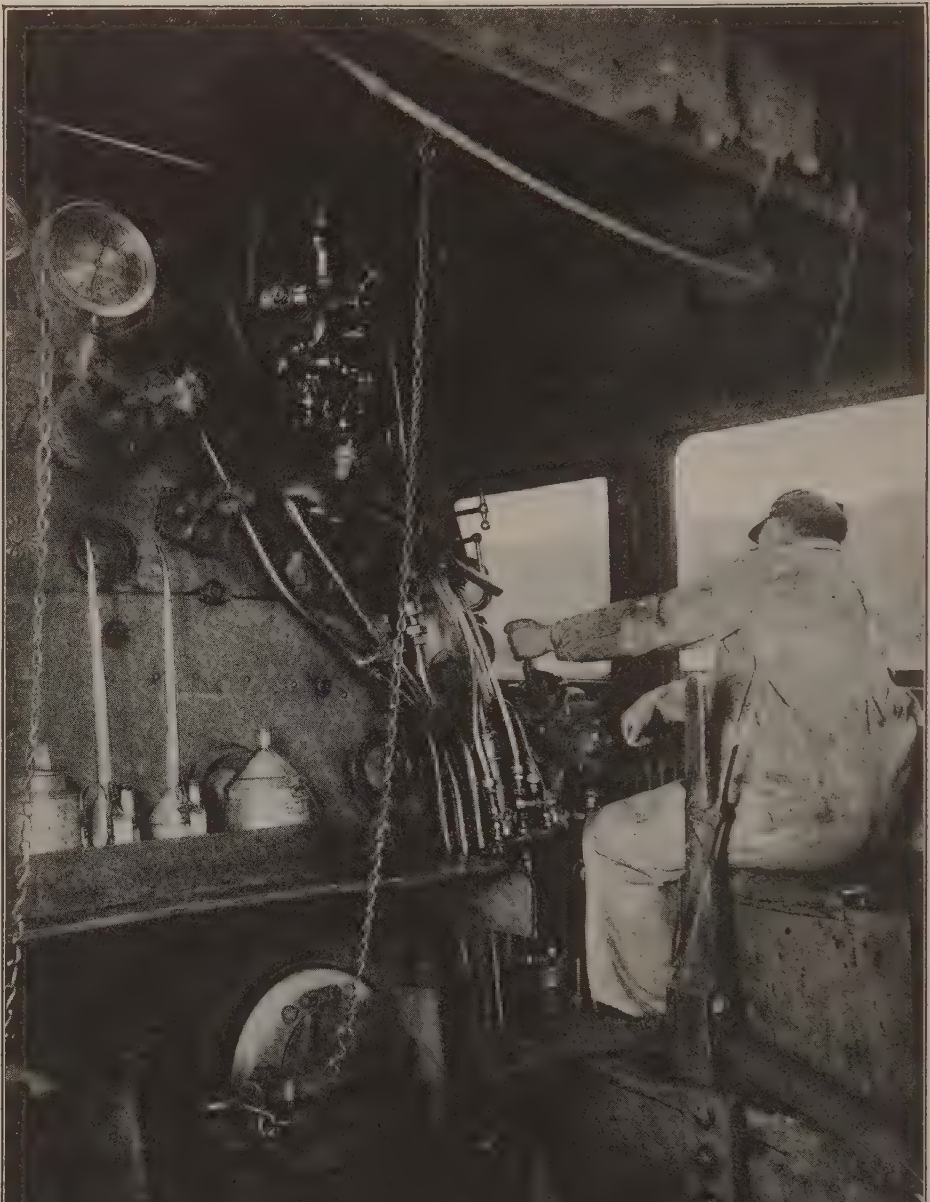


This is an electric locomotive used to draw the trains of the Pennsylvania Railroad through the tunnels under the Hudson and East rivers. This engine gets its power through a third rail charged with electricity, and it can run equally well backward and forward, while a steam engine must be reversed.

Courtesy of John E. Muhlfeld. Photo, Kadel & Herbert.

The high-pressure engine Horatio Allen, built in 1924, has an improved firebox construction, exposing more surface to the furnace heat and producing greater speed of circulation. The steam is used twice. Thus the hauling power is one-third more than usual; the fuel needed, one-third less.

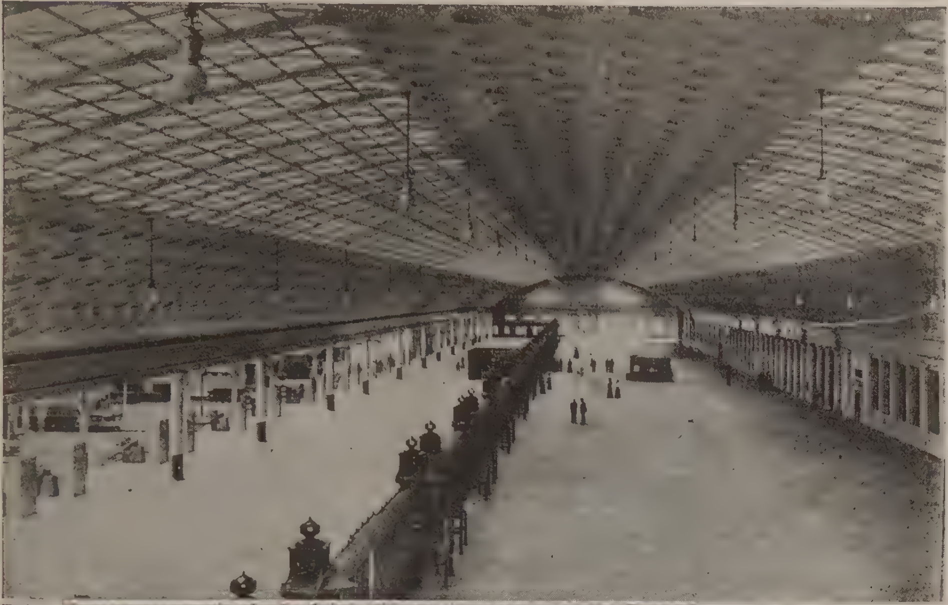
THE GREAT MARVEL OF A STEAM ENGINE



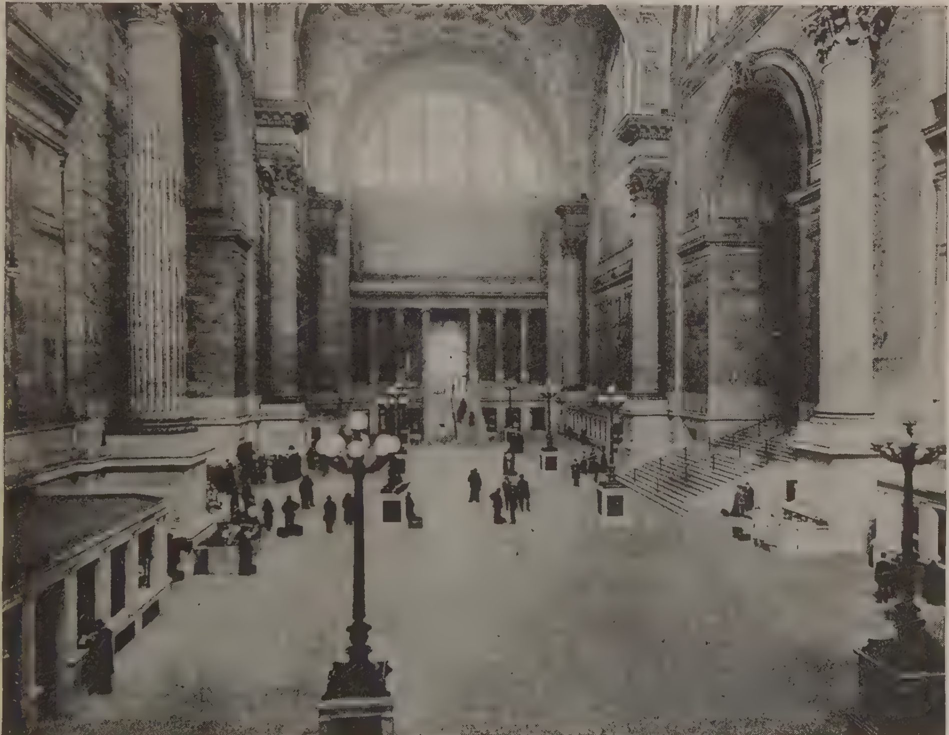
Photo, courtesy New York Central Lines.

In front and on the side of the engineer, as he sits at his post of duty, is a wonderful array of handles and levers, screws and taps. Each of these has a purpose, and by using them at the proper time the engineer is able to start or to stop the train, to go faster or more slowly, to put on the brake, to let off steam, to put more water into the boiler, to blow the whistle, to go backward or forward. A thorough knowledge of the engine and a long experience in working it are necessary before an engineer can be intrusted with such a post. An engineer works for years as a fireman before promotion.

TWO RAILWAY TERMINALS OF THE NORTH



Thirty-three passenger tracks lead into this vast concourse of the Pennsylvania Railroad terminal at Washington, D. C. No other room under a single roof is as large as this, which contains 97,500 square feet. You can see here some of the trains on their tracks, and the gates through which they are reached.



This main waiting room in the Pennsylvania Station, New York, is 150 feet high and over 108 feet wide. The monumental style of architecture has its source in the great halls of ancient Rome, with their fine arches and massive pillars. Ticket offices, baggage-checking windows and telephone and telegraph stations are all in this great room. By the broad stairway, at the right, the arcade is reached, while in the opposite direction lie entrances to smaller waiting rooms and the exit to the train concourse, with its many gates for passengers going and coming. Photos, courtesy Pennsylvania Railroad.

TWO RAILWAY TERMINALS OF THE SOUTH

THE RETIRO STATION IN BUENOS AIRES, ARGENTINA

Buenos Aires, "the Paris of America," the splendid capital of Argentina, is connected by six railways with points north, west and south. Here you see the spacious interior of one of the terminal stations.

RAILWAY STATION IN THE LUZ SECTION OF SÃO PAULO, BRAZIL

This station, too, stands in a city of elegant residences and handsome public buildings. The city São Paulo, capital of the State of São Paulo, in Brazil, is a terminal of importance, linked by railway lines with Santos, its port, and Rio de Janeiro, on the coast, and with various inland cities.

The Great Wall of China was first built in the third century B.C., to keep out invaders from the north. It is 1,500 miles long, and in its course scales precipices and tops the craggy hills, as shown.

THE CHINESE REPUBLIC

THE OLDEST LIVING NATION OF THE WORLD

CONTINUED FROM 48

THE Chinese land covers one quarter of Asia, from the Pamirs to the Pacific and from Siberia to India. The mysterious and wonderful mother country, China proper, lies between the great provinces of Manchuria, Mongolia and Turkestan, and the vast Pacific Ocean. In size China proper is about six times as large as the state of Texas, and its face is crossed by the outlying eastward ranges of mountains running from the great central heights, and by the immense rivers fed by the snows of Tibet and joined by a network of streams on their long journey to the ocean.

It is estimated that over three hundred million people live in China, in its great cities and fertile plains and on the banks of its waterways.

Among the treasures of many of our American homes are to be found curiosities brought by sailor friends and relatives from this wonderland of the Far East, such as delicate embroideries in shining silks of gorgeous colors, dainty carvings in ivory, and exquisite little bits of fine porcelain or china. And as we have looked closely at the regular stitches in the beautiful fabric, we have seen that there is no untidy "wrong side" in Chinese work. We have wondered at the seemingly impossible puzzle of the ivory balls carved one inside the other, or at the unusual patterns on the thin little cups, and we have tried to picture to ourselves the far country whence the treasures came and the patient and clever workers who made them. Perhaps all that we have succeeded in calling before our minds is the strange hairdressing of Chinese men and the tiny feet of Chinese women, upon a misty background of an unknown land of flowers, with gracefully curved buildings and willow-pattern-plate landscapes.

If we have gone to our map of China for help, very possibly we have been dismayed and discouraged by the great number of difficult names in an odd-looking language absolutely different from our own. So perhaps it will help us, in our quest of a closer view of China and its people, to learn a few words of Chinese first, and then, at any rate, we shall understand what some of the names mean, which will give us a much better chance of remembering them, difficult as they are.

In this veritable Land of Mighty Streams, *ho, kiang* and *kong* all mean river; *chan,* or *shan,* and *ling* stand for the mountains between which the rivers run, or through which, in some parts, they force a way between mighty gorges; *pe, nan, tong,* or *tung,* and *si* indicate the points of the compass, north, south, east and west; *hoang,* or *hwang,* is yellow, the imperial color of China; *pei* is white; *fu,* or *foo,* and *king* mean town or court; *hai,* the sea; *chian,* heaven.

Knowing a few words like these, we can easily find the mountains of the east, north and south: Shantung, and the Peling and Nanling ranges. The two last shut in the basin of China's greatest and most important river, the Yang-tse-kiang. Over three thousand miles lie between its sources in the heights of Tibet and its mouth in the Pacific Ocean. It makes a magnificent waterway into the heart of the country, wide and deep enough for steamers to ply for a thousand miles through the rich plains of central China, which the river itself has done much to form, by bringing down fertile mud, as the Nile does along its banks in Egypt.

THE RIVER OF CHINA'S SORROW AND THE TERROR OF ITS FLOODS

In its upper courses, separated from the lower by grand gorges which remind us of the Iron Gate on the Danube, it passes through a rich district of red earth as large as Georgia and very thickly peopled. There are lakes in the basin of the Yang-tse-kiang which act as reservoirs in the time of heavy rains, so that its floods are not so disastrous as those on the Hwang-ho, or Yellow River, which drains through northern China. "China's Sorrow" is one of the names of this river, so dreadful are the floods when it bursts its banks and submerges the surrounding country and towns. It is not navigable for long distances, like the Yang-tse-kiang, but on its banks and in caves in its cliffs live many of China's millions.

Water is not the only gift the inland provinces send to the mother country: another is sand—yellow sand—that has been constantly blown by the strong winds from Mongolia over parts of northern China for centuries, till valleys have been filled up by deep beds of it and the low hills covered with it. So here we have a yellow land, with a yellow river cutting its way through the soft soil, making deep cliffs on each side, and carrying its thick, yellow, sandy waters onward until they pour by ever changing mouths into a yellow sea. One of the titles of the great emperor of China was "Lord of the Yellow Land."

THE WONDERFUL YELLOW SOIL THAT GROWS SEVERAL CROPS A YEAR

The yellow basin of north China is even more fertile than the red basin of central China, several valuable crops being raised in a year on the "loess" soil, as it is called.

The Si-kiang, or West River, drains southern China, rising in the eastern spurs of the Tibetan heights and making its way through dense forests, past mountains with treasures of every sort of mineral and fields with crops that require a hot and moist climate. It is from southern China principally that so many Chinese emigrate to find work in different parts of the coast of the wide Pacific.

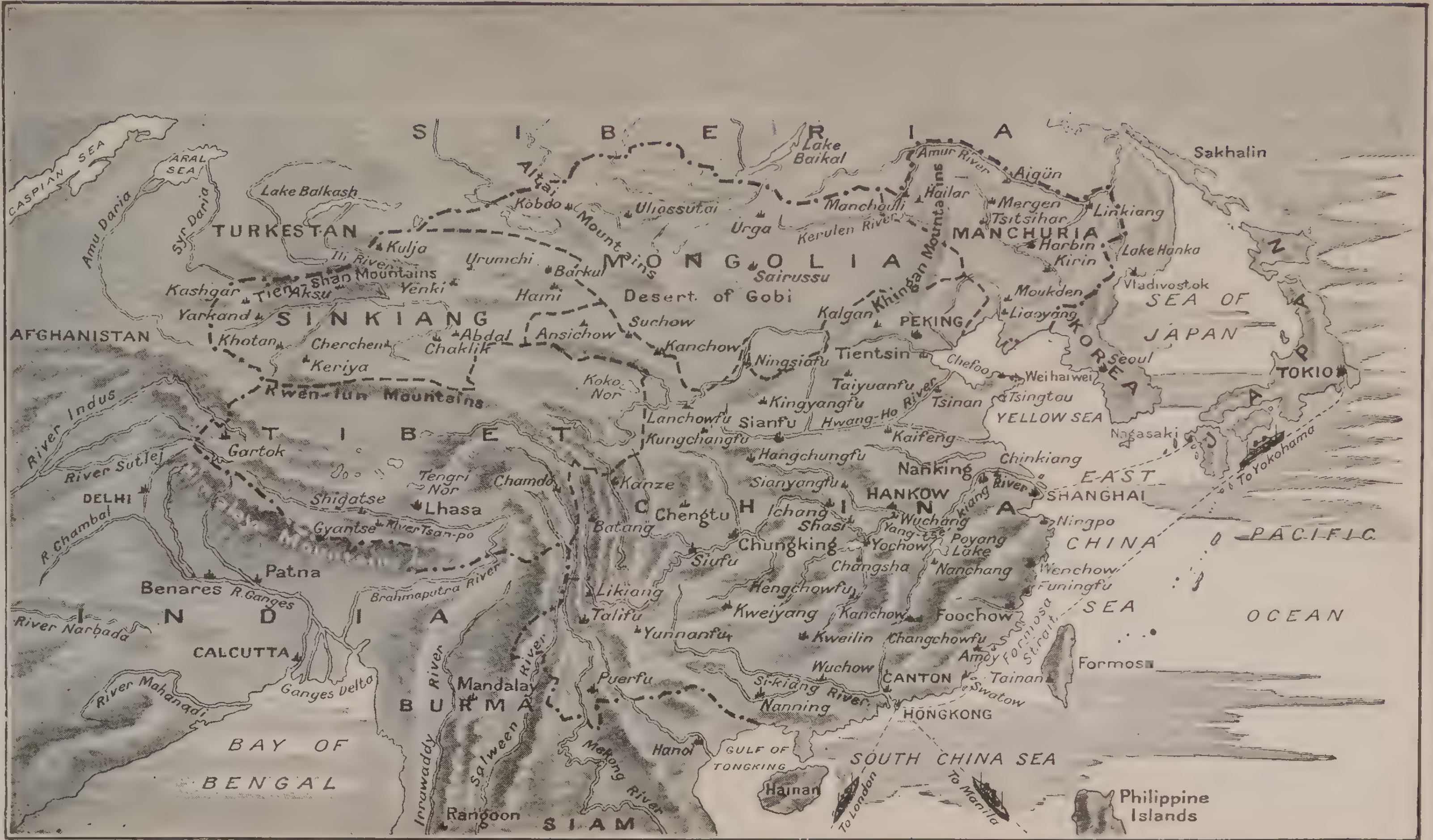
We have often imagined the hum that rises from busy districts and towns in other countries, but from China—from that vast hive of human industry between the solemn, silent, central mountains and the deep, wide sea—it seems as if there must be one continuous and mighty buzz from the whole country, so close are the great cities, so many are the millions of people living and working on the fertile plains.

And this buzz of multitudes is no new thing, as it is in our own country, where great industrial centres are scarcely a century old; neither is it caused, as it is with us, by the whir and thump of machinery and the noise of the iron horse on his journeys to every corner of the land. Railways and machinery are, comparatively speaking, only just starting in the oldest living nation in the world.

THE LAND OF ETERNAL SAMENESS, WHERE CUSTOMS SELDOM CHANGE

For thousands of years her people have been steadily working, growing in numbers and changing rulers, suffering the horrors of war and enjoying the blessings of peace, but always busy in the same old ways, making the same things, cultivating the ground on the same methods for centuries, learning the same lessons in the same language, and competing in the same examinations to fill the same government posts.

CHINA AND THE COUNTRIES LYING ROUND ABOUT ITS BORDERS



China once ruled Tibet, Sinkiang (or Chinese Turkestan), Mongolia and Manchuria, but now these are more or less independent.

It is difficult for us, who are all for progress and new ideas and dislike standing still, to understand this steady keeping to old ways. Two thousand years ago the ancestors of most of us were still in the wilds of Europe—very rough persons, who would find us very much changed in language, manners and dress from themselves.

Now, the written history of China goes back four thousand years—nearly twice as long as that of Europe—so that when Europe was just beginning to make for civilized ways and thoughts, the Chinese nation was two thousand years old. But she lost the advantage of her start of two thousand years by standing still, going to sleep, and keeping to herself for centuries while the young Western nations were forging ahead, developing governments and education and inventions.

THE LONG SLEEP OF THE CHINESE PEOPLE AND THEIR HATRED OF NEW IDEAS

There are many reasons that account for the long sleep. We shall speak of only two that will help us to understand the history of this country so unlike our own. One is that the Chinese have always greatly revered their parents and ancestors, going so far as to make it a first duty to carry on the work of life in exactly the same way that their forefathers had handed down.

Another reason is that, with few exceptions, the Chinese have stayed at home within the limits of their own country. Then, too, since they seldom encouraged foreigners to visit them—indeed, they rigidly kept them out, as a rule—no new ideas of progress and reform, no new knowledge of outside discoveries and inventions could penetrate the wall of reserve that shut in their heavenly, or celestial, kingdom, so superior, as they believed, to the rest of the earth. And, as time went on, they hated anything new or foreign more and more. But that is changing now.

Some say that ages ago the ancestors of the Chinese came from the Tarim basin and settled on the yellow loess-beds where it was so easy to grow food. Anyway, here they lived, advancing in civilization for long, long years, before they spread across the forest-covered mountain ranges which separate the basin of the Yellow River from that of the Yang-tse-kiang. Here, too, the tribes flourished and grew, and in time united under one ruler; the government became more settled, and all sorts of arts developed, such as the rearing of silkworms and the weaving of silk. This has ever been one of China's greatest and most profitable industries.

CONFUCIUS, THE GREAT TEACHER WHOSE WORDS ARE LAW TO MILLIONS OF MEN

Nearly twenty-five centuries ago a great teacher and leader arose, named Confucius, who, during his wandering and hard life, tried to find out how best a man could do his duty to his neighbor and how best he could learn to govern himself. His teachings have been law to countless millions of his fellow-countrymen, his temples are found all over China, and his books have been the foundation of all learning through the centuries; for Confucius collected and set in order the history of the empire, and inspired a great many books in which his teaching is set forth.

A few hundred years after his death a prince of China ordered a great burning of the books of Confucius and cruelly treated those who tried to keep them. One punishment was to send them to labor on a great wall that he was building across the north of China to keep out Mongolian horsemen who were descending on his country. Twenty to thirty feet high, twelve feet wide at the top, faced with granite or hard brick, with many towers of defense, this wonderful wall runs over hill and valley, across sand and river, up the face of the rocks, for fifteen hundred miles along the north border-line of China. This wall still divides China from Mongolia; but it did not keep the Mongols out, any more than the Roman wall across Britain kept out the Picts and Scots.

THE GREAT SILENT DESERT WHERE CHINA'S GREAT WALL LIES BURIED

One of the last explorers to return from central Asia is Dr. Stein, and the discoveries he made there are of importance and interest in connection with this great wall.

For miles and miles, as far as the eye can see, in the basin of the Tarim River, there stretches sand—nothing but dry, parched sand that has fought and conquered mankind, overwhelming towns and villages and sweeping away a flourishing civilization. Of life there is practically no trace. Men have fled before those advancing grains of sand that they

PICTURES OF CHINA

THE GREAT PAGODA
AT CANTON

A TYPICAL OLD
PEASANT

THE LUNG HUA PAGODA
AT SHANGHAI

A SCENE ON THE GREAT PEARL RIVER AT CANTON

A STREET MARKET
IN PEKING

PORCELAIN TOWER AT THE OLD
SUMMER PALACE, PEKING

A STREET OF BOATS
IN CANTON

THE DENSE MASS OF HOUSES IN THE CITY OF CANTON

FAMILY ON A HOUSEBOAT AT CANTON BUSY WITH THEIR CHOPSTICKS

PART OF THE GREAT WALL OF CHINA

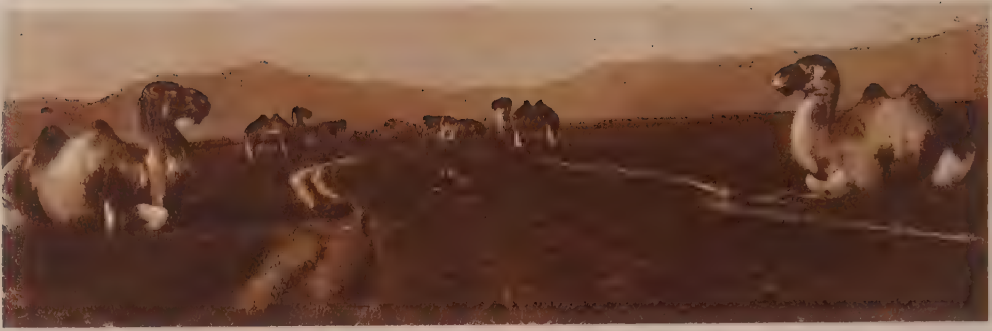
A WIDE AND STRAGGLING STREET IN PEKING

SAMPANS IN THE RIVER AT SHANGHAI, THE GREAT CHINESE SEAPORT

A CHINESE COACH IN A PEKING STREET

A FINE STREET IN SHANGHAI

SPLENDID BUILDINGS IN PEKING



THE GREAT STONE ANIMALS GUARDING THE APPROACH TO THE MING TOMBS

AN OLD MANDARIN READS HIS PAPER

A BRONZE LION AT THE OLD IMPERIAL PALACE, PEKING

A CHINESE LADY IN NATIVE DRESS

SETTING OUT FOR A FISHING EXPEDITION WITH CORMORANTS TRAINED TO CATCH THE FISH

The pictures on these pages are by Ewing Galloway, Underwood & Underwood, the E. N. A. and others.

were powerless to check, animals have died. Only one or two plants are able to exist in those desolate wastes. It is a land of sand and silence, of which some pictures are found in an article about The Heart of Asia.

In these awful wastes, beneath the numerous sand-dunes, Dr. Stein made some interesting discoveries. He found that the Great Wall of China, which hitherto was thought to end at the foot of the Nanling Mountains, does not end there at all. Far away to the west, in the Tunghwan Desert, he found the remains of a great wall, with watch-towers at intervals of two or three miles, that practically joins the wall at the foot of the Nanling Mountains.

This, he believes, is the true Great Wall of China, and the wall which we have always looked upon as the Great Wall is, apparently, much more modern.

THE HISTORY OF A RACE THAT IS BURIED UNDER THE SANDS OF CENTURIES

There, from those silent and deserted houses and watch-towers, Dr. Stein has excavated that terrible sand, little by little, and his labor has been well repaid. Wooden slabs, with carefully wrought symbols and clay seals, private letters, official documents, frail materials of cotton and silk, and ancient paper have all been recovered from the sand under which they have lain for many centuries; and these documents, when translated, may give us a history of the long-vanished race which once occupied the land that is now a great sandy waste, where life is insupportable.

We can imagine with what fears these ancient people saw the sand creeping nearer and nearer; how they battled with it valiantly and tried to keep it from their homes; and how, at length, the sand slowly crept up to the houses and cottages, and into the rooms, driving the inhabitants forth, and gradually covering the entire place in a thick layer. But although the sand has destroyed, it has also preserved, and the relics which have been found will throw much light upon those ancient and deeply interesting times.

Somewhat more than a hundred years before the birth of Christ regular trade was opened up with central Asia by China, and caravans began to wind along the routes from one oasis to another across the deserts, through the passes of Mongolia and Turkestan, to Tibet, carrying goods for trade by the infinite labor of men and dumb animals.

THE GOLDEN AGE, WHEN TEMPLES WERE BUILT AND BOOKS WERE PRINTED

Later the empire suffered from many disturbances and divisions and the struggles among several small rulers to be first and foremost. It was during these centuries, about the times when the Angles and Saxons were seeking their new homes across the North Sea, that the Buddhist religion took hold in China, though it had been introduced from India some centuries before. Temples were built all over the country to house the thousands of images that were brought by the priests and monks.

The three centuries after this are considered by the Chinese as one of the most glorious periods in their long history. Books and authors, schools and colleges, examinations and degrees occupied a great place in public life. About the time when King Alfred was setting scholars laboriously to work with their pens and paint-brushes to copy manuscripts Chinese records mention the printing of books by wooden blocks. About this time, too, an immense encyclopedia was written.

Before very long the fame of this learning and of the gorgeous palaces and riches of China was spread to Europe, chiefly by Arab traders, and ever since, the romance and mystery of China have attracted the imagination and longing of the West.

HOW THE DOOR WAS OPENED FOR EUROPE TO GET ITS FIRST PEEP OF CHINA

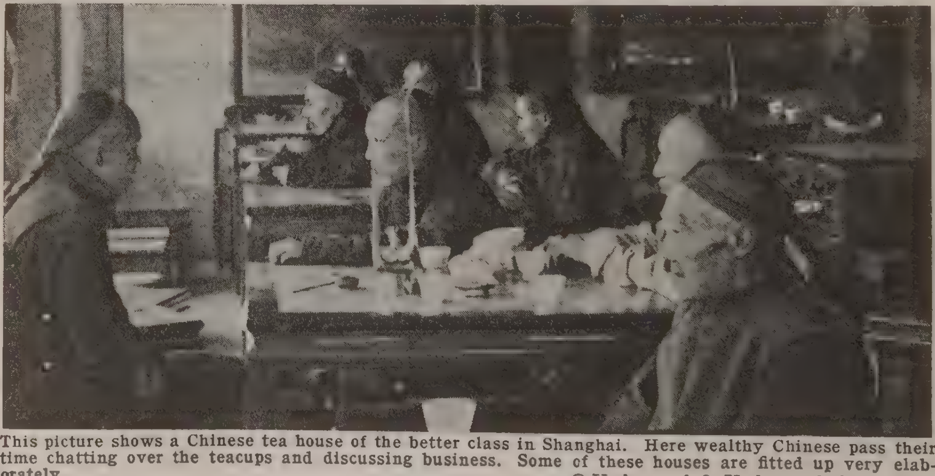
But it was not till the thirteenth century that the famous Marco Polo opened the door for Europe to get a passing view of the wonders of the dim and mysterious land of the Far East.

Early in that century the Mongols had gradually been getting more and more power on the borders of central Asia and in the north of China. When the great leader Jenghiz Khan, the "Greatest of the Great," flashed over western Asia and ruled over an empire stretching from the China Sea to Russia, some of the barriers that had hitherto prevented entry into China were swept away. The huge empire was divided at his death among his sons, and a good deal of intercourse followed between China and Persia, Tibet and Mongolia.

MANNERS AND CUSTOMS OF THE CHINESE

Here we see a Chinese dinner party. Instead of knives and forks many Chinese use chopsticks to pick up their food, and are very skillful in conveying the food to their mouths without dropping it in their laps.

The Chinese believe that a dragon rules over the heavenly bodies, and at eclipses he is supposed to swallow the sun or moon. To appease him a ceremony called the Festival of the Dragon-boat is held, as shown here.



This picture shows a Chinese tea house of the better class in Shanghai. Here wealthy Chinese pass their time chatting over the teacups and discussing business. Some of these houses are fitted up very elaborately.

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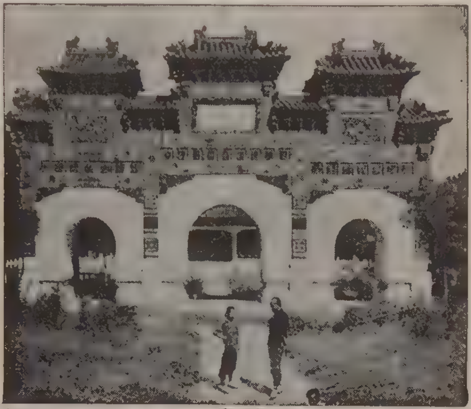
SOME FAMOUS CITIES OF CHINA

This picture shows one of the walls of the city of Peking. The city is divided into two separate towns, one for the Manchus, the other for the Chinese—each inclosed by a wall from thirty to fifty feet high.

Here we see a busy market in the Manchu, or Tartar, city of Peking, the principal part of the capital. This street is in some parts 200 feet wide.



In this picture we see the famous Hall of Classics in Peking, containing 182 pillared slabs with all the Chinese classical books engraved on them.

This is a view of Victoria, capital of Hongkong, the British possession at the mouth of the Canton River. It is a British naval station and an important commercial centre. The mountain is Victoria Peak.

Shanghai is the most important city in the Chinese Empire, so far as European trade is concerned. The European part, shown here, is handsome.

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THE GREAT MONGOL EMPEROR WHO MADE PEKING HIS CAPITAL

It was the grandson of Jenghiz Khan, Kublai Khan, who welcomed Marco Polo so kindly to China, and sent him on so many missions to the wild provinces on the borders of Tibet and other distant parts of the empire. Deeply interesting is the account of Kublai's reign by Marco Polo, as well as the writings of other travelers who seized the opportunity of exploring the heights of the Pamirs and the Tarim basin; and some even crossed the Hwang-ho into China itself.

Kublai added southern China to his dominions, and made his new capital at Peking, the Court of the North. This great soldier proved equally great as a ruler, for he encouraged education and helped China in many ways.

The last of the great Mongol rulers was Jên-tsung. He gave an order that Confucius should be held in great respect. After his death rebellions and murders of emperors, great misgovernment and other troubles brought the rule of the Mongols to an end. In the fifteenth century the Chinese drove them across the Great Wall to the Altai Mountains, and Mongolia became a province of the empire under the Chinese Ming family, or dynasty, of emperors which lasted nearly three hundred years. There were troubles at home and abroad during this time, difficulties with the Mongols and the Japanese, and, most important of all, the door which hid the Celestials from the Western "barbarians" began to open just a little. The Portuguese and Spaniards appeared in China in the sixteenth century, and a Chinese fleet sailed as far as the Red Sea.

A WONDERFUL CHINESE ENCYCLOPEDIA IN THOUSANDS OF VOLUMES

Very beautiful porcelain was made during the Ming dynasty, and another large encyclopedia was brought out which occupied many editors and assistants for several years. It is said that this is the largest encyclopedia in the world. It runs to many thousands of volumes, and a copy of the first edition is now to be seen in the British Museum. The Portuguese traders made but little impression on China, but the Jesuit missionaries managed to make their way inland in China to preach the Christian religion.

There are many splendid remains of the great Ming dynasty in China, especially near Peking. Among them is a long avenue of large stone animals in various postures, leading to the wonderful tombs of the emperors. There are also many magnificent memorial archways.

As the Ming dynasty was nearing its end the Manchus, descendants of old Mongolian enemies of China, settled in Manchuria, about the river Amur, and made increasingly successful attacks on the empire till, in 1644, the Manchu line of rulers found themselves firmly seated on the throne, inside the Great Wall that was built centuries before to keep out invaders. Only in 1912 was the boy emperor driven from the throne.

THE GREAT STRUGGLE OF THE NATIONS OF EUROPE TO SET FOOT IN CHINA

Since the middle of last century a grim and never ending game of the "King of the Castle" has been going on between China and the Western powers that are so anxious to gain footholds in her rich and ancient empire. The chief object for which these footholds were desired was to force the Christian religion and Western ideas upon a country which detested them, and to open up trade with people who had so much to sell and whose great numbers mean great buying power.

Little by little China has been forced to give way, and she has had to admit, one by one, her assailants into some part of the enchanted "Castle." Portuguese, Dutch, Germans, Russians and British for years carried on the struggle, and after wars and sieges and stormings, and endless discussion of a more peaceful nature, the various foreign nations at last gained the right of entry into the land so long closed to them.

It was in 1842 that, by the Treaty of Nanking, certain treaty ports were opened to foreign trading ships, and, as time went on, more and more concessions had to be given to the foreigners; concessions and money were often exacted as a punishment for killing missionaries or other representatives and for burning their property. Shortly after the settlement of Nanking a terrible rebellion devastated a large part of China for fifteen years. In 1864 the British were able to help the Government to restore order. In the centre of Trafalgar Square, in London, stands a statue of that fine soldier and man of action General Gordon, often spoken of as "Chinese" Gordon, from the part he took in putting down this Taiping rebellion, as it was called.

THE FIRST TROUBLED YEARS OF CHINA'S AWAKENING

His campaign in the delta of the Yangtse-kiang, among the streams and canals and lakes, all broad and navigable channels, was most carefully planned, and was full of exciting events. In one action an armed steamer, with a crew of forty men, got the better of a force of many thousand rebels. He drilled the Chinese forces, urged on men less brave and energetic than himself, and showed the Chinese not only how to make war, but how to end it. He received from the Emperor a mandarin's yellow jacket and peacock's feather and other high honors.

These first years of China's awakening after the long, numbing sleep of centuries have, indeed, been full of trouble and pain. There have been almost incessant wars with the neighbors who could no longer be kept out, with Russia, France, Germany, Japan; and during these wars China has learned by sad experience that her old ways of warfare, though picturesque in their setting and almost sacred from long custom, were useless against those of her opponents. Now Chinese troops are drilled by Western methods.

THE BOXER RISING AND THE FLIGHT OF THE EMPEROR FROM PEKING

Naturally there has been much feeling against all the new ideas in this most conservative country in the world: the first railways were torn up as soon as laid; telegraphs were bitterly opposed; and Christian missionaries always carried their lives in their hands. So greatly have they been hated, in spite of the ability and devotion they have shown, especially in organizing relief in times of dreadful famine and plague, that in 1900 a great rising—called the Boxer rising—took place, against the missionaries at first, but eventually all the hated foreigners were attacked. For two terrible months the European residents in China were in great danger. Many were killed, and others suffered all the terrors of a siege. They were shut up in Peking, with a howling mob eager for their lives outside, till relief came and the Boxers were driven away. The allied forces made their way to Peking, and the emperor and his aunt fled far westward for safety, till peace was settled and justice done.

The home of the Dalai Lama on a hill-top at Lhasa, the capital of Tibet.

The efforts of Christian missionaries in China have been sadly hampered by the actions of traders of their own faith, by their want of principle, and by the bad example that many of them have set. Great wrong has been done in the past by Englishmen in furnishing, for the sake of money, arms and help to the rebels who were devastating China when Gordon came to the rescue, and by their insisting on sending into China the poisonous drug opium against the wishes of the rulers—this also for the sake of gain.

The smoking of opium, which destroys men body and mind, has been a terrible curse to China. Of late years strong efforts have been made to put an end to the dreadful trade. As a consequence, the practice of opium-smoking has been much reduced, and soon the cultivation of poppies and the importation of opium will cease altogether.

THE SIGHTS OF THE CITY IN WHICH THE EMPEROR OF CHINA LIVED

Foreigners have now gained more than a mere foothold on the shores of China. It is comparatively easy for them to pass from end to end of the beautiful and wonderful kingdom. Many travelers have already done so, and they have shown us, by words and photographs, the marvels of this long-shut-up land. Let us, too, pass in.

There are three main ways of reaching China. We can go to Europe and then by the Siberian Railway, branching off through Manchuria and crossing the Great Wall to Peking; or we can travel to the East by going westward—that is, by train across our mighty continent to the Pacific, where steamers take us across to its other side; or by steamer across the Atlantic and then through the Suez Canal to any chosen port.

All are most delightful and interesting journeys. Let us start at the Court of the North. Peking contains at least a million inhabitants, and is near the Pei-ho, at the mouth of which is its port, Tientsin. Peking is really made up of two cities—the outside Chinese city, where business is done, and the inside, or Manchu-Tartar town, where the foreign embassies are.

The emperor held his great court in an inclosure full of splendid buildings in the centre of the Tartar city. To this famous Forbidden City very few foreigners ever gain admission.

Grand, indeed, were the pageants to be seen when the emperor visited the Temple of Heaven to pray for a good harvest, leaving upon the mind a dazzling blur of golden yellow—the imperial color of the Lord of the Yellow Land—of brilliant touches of blue, green and crimson, as the trains of high officials in gorgeous array passed in the procession. Long were the ceremonies, bowings and prostrations, endless the prayers and readings from silken scrolls, as the incense floated toward heaven from bronze censers.

In China men used to go on being examined all their lives, chiefly in order to obtain appointments. There were examination centres all over the country, but it was to Peking that thousands came every year to try to get into the highest college of all.

In Peking are the imperial factories, where beautiful silks and china are made which the emperor gave as presents; and many splendid buildings, temples, tombs, palaces and fairy-like gardens stand out in striking contrast with the dirt and poverty everywhere to be seen. The dust—yellow dust—is dreadful in Peking and penetrates into palace and hovel alike.

There are railways now being rapidly developed in many directions, especially in the rich delta plain of China, connecting the chief ports and running far inland. Steamers, too, ply on the network of rivers and canals beside the old-fashioned boats with square sails, called junks, so familiar in Chinese pictures. Where the shifting bed of the Hwang-ho has to be crossed the bridges are some of the longest in the world.

Shanghai is at the mouth of the Yang-tse River and is one of the chief trade centres in the country. Here we find rows of European houses and shops, with their names hanging downward instead of across a signboard; and the public gardens are full of most glorious flowers. Crowds of people, European and Chinese, rich and poor, throng the streets; and factories with smoky chimneys remind us of the new ways that have begun to replace the old.

Nanking—the Court of the South—is also a very important place on the Yang-tse River, and higher up still is Hankau, a great place for the tea trade. The porters waiting about for work on the tea steamers make us think of our dock laborers at home.

From Hankau it is still some distance to the wonderful Yang-tse gorges, a thousand miles up the river from Shanghai. The high precipices and towers of

THE GREAT WALL OF CHINA

Late in the third century B.C., Shi-Hwang-ti ruled as the "first universal emperor" of China's united provinces. The wall, built to protect the northern border from invaders, is a monument of his reign. In later years it was repaired from time to time; and about 1547 a stretch of 300 miles was built to extend the wall beyond the original 1,200 miles. The height was the same all the way, with a tower at every hundred yards, where soldiers might keep guard.

rocks and pinnacles, all of most fantastic or massive shapes, are relieved by the lovely trees and shrubs and by profusion of flowers all growing wild, such as larkspur, jasmine, white lilies, sun-flowers and many others that we grow in gardens and hothouses in America. It is exciting work punting the boats on the rapids, and, before long, communication between the two ends of this difficult part of the river will be improved. The rich province of Szechwan, watered by the upper Yang-tse River, is full of the beauty of mountain and water, and also bears great crops.

THE GREAT CHINESE PORT OF HONG-KONG THAT BELONGS TO BRITAIN

There are many wonderful Buddhist temples and monasteries all over the country, often on mountains that are most difficult to climb. Pilgrims visit the shrines of saints; and prayer-wheels and ringing of bells and grand ceremonials, with reverence of the lamas, show how widespread is the ancient religion.

Hongkong, an island half the size of Staten Island, New York, at the mouth of the Si-kiang, or West River, belongs to the British. It is now important, both as a trading centre and as an army and navy station, though it was a bare rock when it became a British possession. Victoria, its capital, has a splendid harbor, and on its long quays and in and out of its hive-like warehouses thousands of Chinese work, dealing with the immense stacks of goods—silk and tea, cotton and woolen goods, coal and food—which pass through this great port.

Canton—the City of Perfection—is also on the West River, and for long it was the only port open to Europeans. Many Chinese live in boats on the river at Canton and on other waterways.

THE CRUEL CUSTOM OF CRUSHING AND PRESSING THE FEET OF CHINESE GIRLS

Life is very hard for the poor, and girl babies are not welcome in poor families; but every family wishes for sons who will carry on the worship of ancestors. For the Chinese believe that the only way a man can be blessed with happiness after death is to have his descendants perform acts of worship in honor of his memory. So on festival days you may see family parties visiting the cemeteries to reverence with gifts and feasting their relatives who have gone to be "guests on high."

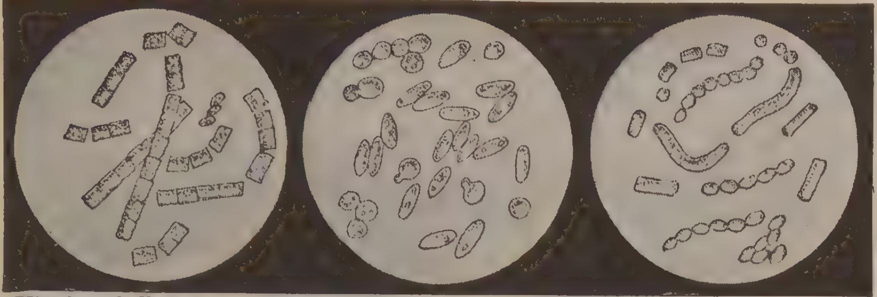
Girls in China have had some hard things to bear. It has long been a custom that, married when very young, the little bride should go to live in her mother-in-law's house and become a mere drudge. Another custom that has made a girl's life painful is the cruel one of binding her feet; for no high-class girl used to be allowed to grow up with feet of normal size. If she had not tiny feet, nobody would think of marrying her. So the baby's feet were bound with linen bandages, drawn ever tighter and tighter; the toes were crushed under; and wee silken shoes were pulled over the deformed lumps. Thus through years of torturing confinement the bones were cramped that our little lady might possess the admired "lilies"—feet which would never be useful but which were thought becoming to her rank.

CHANGES THAT COME WITH THE PASSING OF TIME

Happily, the practice is fast dying out. There are anti-binding leagues, and many Chinese insist upon having their daughters' feet left free to develop with the rest of their bodies. When, a little while ago, the new Government ordered Chinese pigtails to be cut off, another old custom was lost. The long queue, with the front of the head shaven smooth, had long been considered a mark of honorable distinction, although when this headdress was first forced upon the Chinese by the conquering Manchus it had been a badge of submission, distinguishing the conquered from the victors.

It seems strange to think of China as a republic, with a president and a parliament; but that is the form of government which was set up in 1912. The presidents chosen since then have had little peace because of trouble with bandits and rebellions under bold "tuchuns," or military governors of provinces, who have taken upon themselves most of the power of ruling. And part of the time there has been a separate southern government around Canton. In 1917, during the World War, China declared war against Germany and Austria, and sent many laborers, but no soldiers, to Europe. Very early in the war the Japanese drove the Germans from their leasehold in Shantung and then stayed on themselves until 1922, causing China great uneasiness.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 561.



Microbes of all shapes and sizes occur in nature, and all have their particular chemical qualities. In these three circles are seen, enlarged about a thousand times, some of the many microbes found in milk, cream and vinegar. Some turn milk and wine sour; and some give flavor to cheeses.

THE TINIEST LIVING THINGS

CONTINUED FROM 259

WE have to talk now about the simplest kinds of living creatures that we know, and about the things they do. Not only are they interesting in themselves, but their life affects the story of the earth, which they are constantly helping to change in many ways.

These living things are extremely small; they have many names, and are often called *germs*—the germs of disease. But the great Frenchman Pasteur, who found out that some of these things often make us ill, called them *microbes*, a word which really means "small life."

As they so often make us ill, most people think all microbes are evil, but only a very few microbes make us ill. By far the greater number of the microbes are not merely harmless to us, but we could not live without them.

The first thing to learn about microbes is that they are very small—so small that unless we have some way to help our eyes we can never see them; and, indeed, some people believe that there are many microbes so small that, however much we help our eyes, we cannot see them. Men therefore could not know that microbes existed until the invention of the wonderful instrument called the microscope, which magnifies small things so that we can see them. Yet even the microscope cannot show us how many kinds of microbes there are. They abound in ordinary air, they are on everything you can touch, in the house or out of doors, and they have even been found in the snow in the Arctic regions. They are to be found in all water. They are practically everywhere—tiny living creatures, living their own lives.

It is a very easy thing to grow microbes. You may take a few by dipping the point of a needle in something containing them, and then put them into milk; you may stroke the needle across the cut surface of a potato; and in many other ways you can watch microbes growing. You cannot see the separate microbes with the naked eye, but you can see a colony of them. Different kinds have different ways of spreading, and anyone who knows them can pick up the tubes in which they are growing and say what kind of microbe a tube contains.

Microbes are too small for us to see their structure, but they all seem to be made very much alike. Every microbe simply consists of one little piece of living matter called a *cell*. That is its whole body and does all the work of a living creature for it. Some microbes are round, and some are like little short rods; some are very thick, and some, like those which cause influenza and tuberculosis, are very slender. But all microbes, whether harmless or dangerous, and wherever they live, consist of a single cell.

YOU COULD PUT A HUNDRED MILLION MICROBES ON A COIN

It is very important to realize that a complete living creature which moves and grows can do these things even though it has no mouth, no lungs, no muscles. We have to learn that some of the things we do by means of many different parts of our body made specially for the purpose, can be done by living creatures that consist simply of a single living cell. So far as we can see, it is the same throughout, and no different parts at all can be observed.

When they are growing in one place, perhaps they are round or very short. When they are growing in other surroundings, they may become long or thin. This is very likely a question of the kind of food they get, and it reminds us that the people who grow up in the slums are usually short, while people who have good food and grow up in fresh air are generally taller.

Considering the great things they do, the smallness of microbes is wonderful. A fair average size would be a twenty-thousandth part of an inch across. If you took some of the little rod-like microbes and could place them end to end, nearly ten millions would be required to reach a yard, while a hundred millions would be necessary to cover a quarter in a single layer, and 640,000,000 billions to make a solid cubic inch. (You know that a billion is a thousand millions, do you not?)

SEEING A THING TEN THOUSAND TIMES ITS LENGTH

This gives us some idea how tiny these tiniest of living things are. We should not forget that there may be many others which are tinier still, so that we cannot even see them with microscopes, which are able to make a thing look ten thousand times as long as it really is. When a microbe has reached its full size—though that is not much to boast of—it does not stop feeding and growing, but divides into two.

The rate at which microbes multiply can scarcely be believed. Starting with only one microbe, and giving it sufficient food, in only 12 hours we should have something like 18 millions, and 6 hours later we should have nearly 80,000 millions. All this would simply be the result of taking in food, growing and dividing, and repeating the process at a tremendous rate. They cannot grow unless they get enough food of the right kind, and this does not always happen.

Microbes grow at rates something like this when we cultivate them on purpose and give them the kind of food they like best; and also, unfortunately, they multiply like this sometimes when they attack us and make us ill, especially in the case of people whose bodies are just suited for microbes to grow in.

MICROBES ARE REALLY PLANTS, BUT LIVE LIKE ANIMALS

But we must understand that not many kinds of microbes can grow in our bodies at all, and that most of them are killed at once when they enter our bodies. It is also well to remember that there are certain kinds of microbes which our bodies will kill at once if we take care of our health and live sensibly. They may kill us if we have been doing foolish things and thus lessened our powers of protecting ourselves from these enemies.

The various shapes of microbes, we have said, matter very little, but what does matter a great deal is the two different kinds of ways in which microbes feed, and this we must clearly understand. Microbes belong, on the whole, to the vegetable world rather than to the animal world. Though they are really tiny plants, none of them contains any of the green matter which enables plants to live on air as well as to breathe air. Therefore, so far as their feeding is concerned, microbes are in the same position as animals. They are all compelled, like animals, to live upon food furnished them by the bodies of other living creatures.

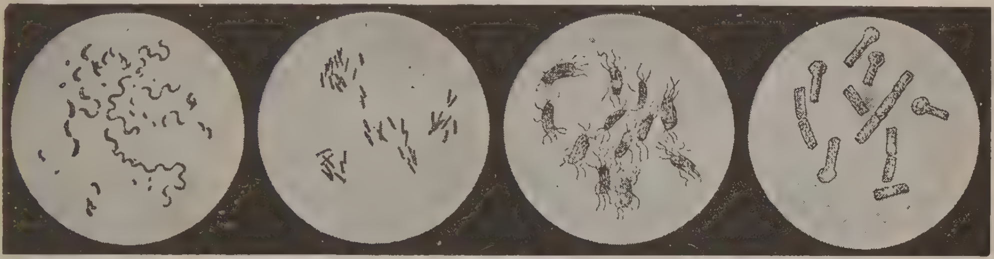
This is the great mark of microbes—that they live upon the bodies, either alive or dead, of other living things. These may be animal or vegetable. The great difference between microbes is that some of them live on the dead remains of living things, while others will attack and feed upon animals or vegetables when they are still alive. Here we speak of those much more numerous microbes which live on dead matter, though always matter that has once been alive. These play a great part in the world; indeed we could not possibly live without them.

Consider how many countless millions of living creatures—human, animal and vegetable—are on the earth, in the air and in the sea, at this moment. For untold ages this has been so. Yet, as we know, these creatures die, and those who came before them have been dying in countless numbers every day for ages past. Now, if we consider for a moment, we shall see that if there were no means by which the bodies of all these creatures were disposed of, the earth must long ago have been heaped up with them. We could not make our way through the forest if the bodies of all the animals that have died there still remained in the places where they fell.

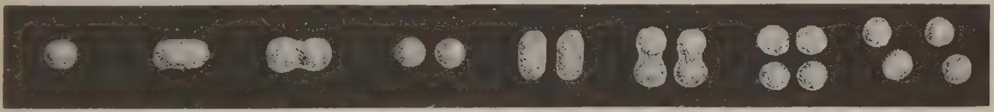
The truth is that life simply could not go on if there were not something at work which, all the time, is taking the bodies of plants and animals as they die, and doing something to them, so that they simply disappear and are got out of the way. But, more than this, there is something at work which takes these bodies—in themselves dangerous and disagreeable—and turns them into simple materials which are used as food by the new creatures living at any time.

We see in the story of Plant Life how microbes take the dead leaves in the autumn and turn them into stuff which can be used for making new leaves in the next spring. Microbes, then, do for the dead bodies of all living things what they do for the dead leaves. They keep the world young and fresh and green. It has very often been said that they are scavengers, meaning that they are like the men who empty the ash cans and keep the streets clear of all refuse. Microbes do this, it is true; but that is only the beginning of their work, and not nearly the most wonderful part of it. Far more wonderful is the way in which, living their own lives, they take things which would be disagreeable, or which, at the least, would be useless, and turn these things into the sources of new life. Near some of our great cities sewage and other refuse is changed by these tiny bodies from something unpleasant and possibly carrying disease into harmless material.

One of the most important lessons we have to learn is that there is really nothing useless in the world. Microbes are the humblest kinds of living creatures, but they are not contemptible. Without the work they do in the course of their humble and unnoticed lives, no higher form of life upon the earth, vegetable or animal or human, would be possible.



Our microbe enemies enlarged 1,000 times. The first are the microbes that cause cholera; the second cause tuberculosis; the third cause typhoid fever, and the last cause lockjaw.



A microbe beginning. Five minutes later. After 15 minutes. It grows into two. Both begin to develop. Both form "waists." They become four. An hour later.

We can get some idea of the unceasing way in which these microbes are everywhere doing their work if we examine ordinary earth and find how many microbes it contains. One grain of ordinary earth will contain anything from one thousand to three hundred thousand microbes. Their numbers are greatest in earth in which many plants are growing. If we think of the thousands of microbes in a single grain of earth, and think how tiny that quantity is, we begin to realize that it is not possible to say how many microbes there are in the world.

We shall speak many times of various kinds of microbes, some harmful, some helpful. What we are trying to do now is to impress upon you that not all are hurtful, and that life could not go on without them.

THE NEXT STORY OF OUR OWN LIFE IS ON PAGE 557.

GRIZEL HUME IN THE PRISON AT EDINBURGH

The brave little Grizel hid herself in the shadow of the cell until the jailer had gone. Then she came forth to give her father's message to the prisoner. His son, who was in the cell, admired her bravery.

A wedding in the hills of Scotland during the persecution of the Covenanters.

BRAVE GRIZEL HUME

CONTINUED FROM 230

WE may search all history without finding a more charming story of heroism and devotion than that of Grizel Hume. Most of us might hope to be heroes or heroines for the time being in some desperate situation, but Grizel was a heroine all her life. She was born at Redbraes Castle, Berwickshire, on Christmas Day, 1665, and was the daughter of Sir Patrick Hume, or Home—we are not certain now about the spelling. There were eighteen children in the family—and all of them, save two, were younger than herself. She, however, was the special favorite of her father. She showed such extraordinary intelligence that he intrusted her, when she was quite a tiny girl, with secrets which involved his very life, as well as the fortunes of his family.

For we must remember that at this time Scotland, and a great part of England, were greatly excited over what is known as the Covenant. After the Reformation religious men in Scotland bound themselves by this Covenant to do all in their power to oppose the pope and to foster and extend the Protestant faith. When Scotland joined England against Charles I, the Covenant was agreed to by both nations; and when Charles II, after his banishment, was allowed to go back into England to take the throne, he signed the Covenant on landing, and signed it again on being crowned. As soon as he had gained the throne, however, this dishonest king declared the Covenant illegal, and forbade people, on pain of death, to be bound by it. The result was practically civil war. Soldiers were sent to put down the Covenanters. They hunted and killed them with great cruelty, and Scotland became a land of blood and tears.

Grizel's father held to the Covenant, and was several times imprisoned as the result. When Grizel was only ten years old she knew all that was happening. She was filled with sympathy for the persecuted Covenanters, and burned with wrath against the cruel soldiers. At twelve years of age she was called upon to play her first heroic part in life.

A splendid character named Robert Baillie, a bold Covenanter, had been cast into Edinburgh Prison. He had made the mildest attempt to obtain justice for a Covenanting minister who had been wrongfully arrested through the false charges of a scoundrel. The authorities did not bother about the minister: all they wanted was to get hold of Baillie. They threw him into prison, and detained him for a long time. Eventually, after many pretended trials, they took him one day to court in his nightclothes, when he was at death's door, tried him and sentenced him to be hanged and quartered. And the shameful sentence was carried out upon the dying man. That, however, happened after the date at which our story opens.

At the time that we first meet little Grizel, Baillie was in prison, and it was necessary for Sir Patrick Hume to communicate with him. Sir Patrick dared not go himself or the soldiers would have seized him as well. So brave little Grizel, this child of twelve, went in her father's place. Seeing a jailer going into the prison, she slipped in behind him and hid herself in the shadow of the cell until he had gone, then came forth into the middle of the cell and delivered the message which her father had given her.

In the cell with the poor prisoner there was a little boy—George Baillie, the prisoner's son. How he admired the bravery and skill of the little girl in eluding the guard and getting into the prison! She, on her part, admired the little boy, who was there sharing the misery of the cell with his father.

Grizel managed somehow to get safely out of the prison and to make her way back from Edinburgh to her father's home, taking the message which the prisoner had given her.

Having executed Baillie, the authorities now thirsted for the life of the valiant Sir Patrick; and about a year after the death of Baillie the Humes heard that the soldiers were on their way to Redbraes Castle. To be taken would mean death, but how was he to escape capture? It was certain that he could not hide in or near the castle, for the soldiers would search every nook and cranny. Sir Patrick, his wife and Grizel, and a carpenter named Winter put their heads together, formed a plan and decided on a hiding-place. They dared not let the other children, or servants know it, for fear the soldiers should get the secret out of them.

Winter and Grizel went at dead of night to Polwarth Church, which was a mile and a half from the castle. There they carried a bed and bedclothes, and made a hiding-place for Sir Patrick in the family grave of the Humes in the church. In that resting-place of the dead the living man was to take up his abode. He went as soon as the retreat was prepared, and when the soldiers arrived at the castle not a trace of him could they find. They could only believe that he had fled from the neighborhood. Meanwhile Grizel's father was safe in the church vaults, but he had to be fed. He could not return to the castle, for the soldiers lingered in the neighborhood; but where he was he might as well be dead, so helpless was he. Brave Grizel was equal to this difficulty also.

Night after night she carried food to her fugitive father. The task of getting this food was in itself very hazardous. It would not have done to take it from the larder, for the servants would have missed it and would have had their suspicions aroused. The only way was for poor Grizel to smuggle the food off her plate, and into her lap, as she sat at meals. That was her method, and once she was nearly discovered. Her mother gave her a very bountiful plateful, and presently one of her brothers, looking at her plate, noticed that practically the whole supply had disappeared, and called the attention of the others to what he thought was Grizel's greediness in eating so much with such speed.

But the smuggling of the food to her father was not Grizel's chief difficulty. Every night at twelve o'clock she used to set off to walk the lonely mile and a half to the church. Of course she had to go alone. That in itself was a terrible trial for the nerves of a young girl. The thought of passing through a graveyard at that hour of night would have sufficed to scare most people. But, in addition, Grizel ran the danger of discovery by the soldiers who were in the neighborhood, and of meeting country people out poaching, who would have followed and spied upon her. Then there were dogs at large to bark at her and increase her terrors. But she smothered all her fears, and night by night went bravely on her way to feed her father, to stay and talk for some time with him, to cheer him with such news as she could tell him, and to inspire him with courage to bear his dreadful captivity.

At last Grizel thought it would be safe for her father to return to a hiding-place in the castle. So she and Winter dug a great hole in the basement of the castle.

They were afraid to use a spade lest the noise should be heard, so they used their finger-nails for the work. Early every morning they would take up, in a cloth, the soil dug out during the night and empty it in the garden, and cover over the hole. At last the hole was made large enough to admit a big box. In this they placed bed and bedding, and then, one night, Sir Patrick crept home and hid himself in the new sanctuary. For a week this refuge held good, but water drained into the hole and made it impossible for Sir Patrick to remain, so he determined to flee abroad for safety.

Grizel altered his clothes to make them like the clothes of a peasant, and when news came to the house that the soldiers were again on the hunt for him, he set out. He made his way to London, and secured a passage on board a ship which took him to the Continent. His estates were now declared forfeit to the crown, and the family were left without means. Grizel and her mother went to London and pleaded for support, and were granted $750 a year out of the estate.

Sir Patrick was not idle in the meantime. He joined with others in an invasion of Scotland, but this was defeated, and he had to retire to Ireland, accompanied by his wife and all the children but one, a daughter who was left in Scotland. But the others could not rest without her, so off to Scotland went Grizel, alone into all the dangers of that unhappy country. She rescued her sister, collected some money owing to her father, and then set out to Holland, where the others had gone in advance. Grizel was the little mother of the family. She relieved her mother of the cares of the household, and she studied music and languages and wrote quite charming poetry. The family were very poor, of course, but with such a girl to inspire them, how could they help being happy? Grizel used to say that those years of poverty were the happiest of her life.

She had by this time grown into a beautiful and accomplished young woman, and more than one handsome young man sought her hand. But little George Baillie had by this time developed into a handsome, brave young fellow, and, an exile from home, was serving in Holland in the Guards of the Prince of Orange. The friendship begun in childhood between himself and Grizel had ripened, and, poor as they were, the two loved and hoped.

At last their reward came. The Prince of Orange entered England with an army, and the wretched King James II, who had succeeded to the throne at the death of his brother Charles II, was driven from the land. Then those good and brave men who had suffered in the evil days were restored to their estates. The Princess of Orange so admired Grizel that she wished to make her a maid of honor, and always have her at court.

But Grizel preferred to return to Scotland with her father, who was now created Earl of Marchmont and made Lord Chancellor of Scotland. Grizel, as an earl's daughter, now became Lady Grizel Hume. But she was not long to be known by that name. George Baillie had returned to Scotland, and the sweethearts were at last married, in 1692, fifteen years after they had first met.

THE MAN WHO LOVED THE HOUSE

HE had a poor little name—William Twopeny—but in other ways he was rich. In 1797, when he was born at Rochester, many great artists were at work in England; and Nelson, always ready to save his country from Napoleon, was soon to win the great battle of the Nile, August 1, 1798.

When Twopeny was eight years old, in 1805, Trafalgar was fought and won, and Nelson, in his last words to his sorrowing officers, said: "Thank God, I have done my duty!"

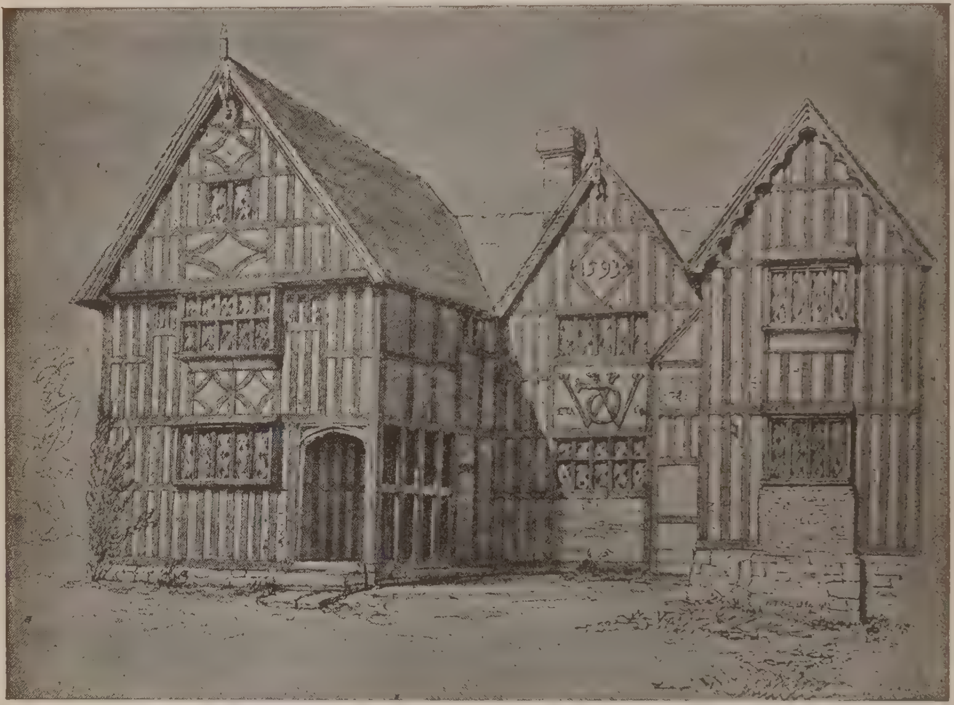
Then Wellington took up the burden of England's fight for life; and Twopeny was eighteen when peace and safety were gained at last on the stricken field of Waterloo, June 18, 1815, at sunset. Think of those times, read about them, and you will see that it was a noble education to be a child then; for boys and girls were taught by danger to understand that the word *home* meant *country* also. If Napoleon had won, there would have been no British homes in Ireland and Scotland and England.

William Twopeny never forgot that lesson, though he lived to be an old man, dying in 1873. His heart was always young, and from first to last he worked very hard, learning to know what England was like in the past; how her people lived at home, and how they made beautiful things—houses and cottages and churches, barns and bridges, furniture of many kinds, and songs, plays and poems, and beautiful pictures.

There was little that he did not know about the story of the English houses; even a few words of help and advice from him were worth years and years of loving patience in a search after truth—after knowledge; and so a great many persons, many of them distinguished, came to him for help when books were written on English churches and English homes. Yes, and we, too, must go to him now, not once, but many times, to make friends with his beautiful work, and to see how he traveled from London to many parts of England, often on foot, drawing with a pencil all the most beautiful things he could find, until his many albums of sketches made a history of English homes and churches from the twelfth century to the seventeenth.

A year after his death these albums of drawings were presented to the Print Room of the British Museum, in accordance with his last wishes; and anybody who goes there can see them to-day. There are twenty-eight albums in all, and they contain many hundreds of exquisite drawings; yet their beauty is little known. The children of England have not yet heard of them, and the grown-ups are too busy to visit them. Twopeny, then, is a kingdom to be rediscovered; it is he who rules over the realm of home through six centuries of its long history.

And what do these books represent? Houses of English workmanship from the twelfth century to the reign of Charles II. Rooms, too, and beautiful details, like windows and doorways, large fire-places, within which logs and fagots burned on fire-dogs; and wall-paintings, stained glass, and charming old furniture, which the generations have neither broken nor worn out. And there are castles, and huge barns built like churches, with naves and aisles, setting us thinking of those days when England owed all her riches to her fields, so that foreigners used to say that her wealth was wheat and wool, and that she grew and banked money on the backs of her sheep. Other drawings represent village churches, with tall spires shooting up toward the sun,



A beautiful drawing by Walter Twopeny of Pound's Ridge, near Penshurst, Kent.

as if they, like skylarks, wished to be near at the same moment to the points of heaven and home.

Only those who see his pictures can understand the delicate strength and beauty that William Twopeny put into his swift pencil-work. He drew as a musician plays, understanding all and loving all; there was magic in his touch and a great sympathy in his heart. One thing he never could forget, and it is a thing that we must learn to see with our own eyes. It is this: that Twopeny realized that he, with his pencil, must make real the life in all things. For instance, the life in clouds is their lightness. We see that they are not heavy, but float overhead, and are blown about by the winds. Yet clouds in a great many pictures look as heavy as the walls of a house, or as solid as the trunks of oak trees. Those pictures are not the kind that came from Walter Twopeny's pencil.

Old houses at Chester.

Or, again, what is the life of a pool of water? Its liquid transparency. It looks like a brilliant eye in the fields, gazing up at the heavens and changing with their color. Artists must show that in their pictures; water must look like water, and not like hard, slippery ice.

And the reality of many noble old houses must come into the artist's pictures too. We see from Twopeny's drawing that a house stands firmly on solid land, and that it is safe when tempests beat upon its walls. We see, too, that the stones are worn by time and use, but that weather-stains and mosses have hidden many a scar. And artists must show all this if their work is to be good and to be loved. But when you take a pencil in your own hand and try to draw with its lead point, you feel weak and foolish, perhaps, for how can so much be done without bright colors, with just a few lines in different shades of gray? How, indeed! Yet Twopeny did it. He, with his pencil, could do whatever he wished, swiftly, and with ease. So let us make friends with his delicately strong work, and learn to love what he loved. It is worth while.

Steps at Powis Castle in Wales.

But what about the man himself? Was he prosperous and happy, or did he die of despair, misunderstood, neglected, and desperately in need of money? Unluckily, very few facts have been discovered. There is no contemporary account of his life, though his drawing and his knowledge helped to make important books on English architecture. But three or four things are beyond doubt. Twopeny was well-to-do, for he was able to be a patron to another artist, J. W. Archer, who received from him a commission to make twenty drawings a year of "Old London." Archer was a clever and charming draftsman, and it is pleasant to know that he won so much friendly help from Twopeny. His work also can be seen in the Print Room of the British Museum. We learn, again, that Twopeny's father was a student of the past, a devoted antiquarian, living at Rochester, but that Twopeny made his home in London. He traveled much in England; we can follow his travels in his work, which is, after all, the best autobiography that a man can leave to inspire those who come after him.

A HEROINE OF THE SOUTHERN SEAS

FAR away in the Pacific Ocean are the Sandwich Isles, for the most part formed of coral, but with lofty volcanic mountains in their midst.

One of these is named Mauna Loa, and is one of the largest and most terrible volcanoes in the world. Its crater Kilauea contains a lake of liquid fire from six to nine miles round, and the smoke of it rises like a cloud by day and night. The natives used to believe that amid the fire there dwelt a fierce goddess named Pe-le, whose bath was in the mighty crater, and whose hair was supposed to be the glassy threads that covered the hills. Everyone stood in awe of Pe-le, especially women.

The priests said that if a woman climbed the mountain, picked berries from the bushes and flung them into the lake of fire, the goddess would "shake with her thunders, and shatter her island."

But a hundred years ago Christian missionaries came to the island, and gradually the people gave up their faith in the fierce and savage deities they had worshiped, and began to serve the one true Maker of Heaven and Earth. Only the fear of Pe-le was still on them, and her mountain was the heathen stronghold.

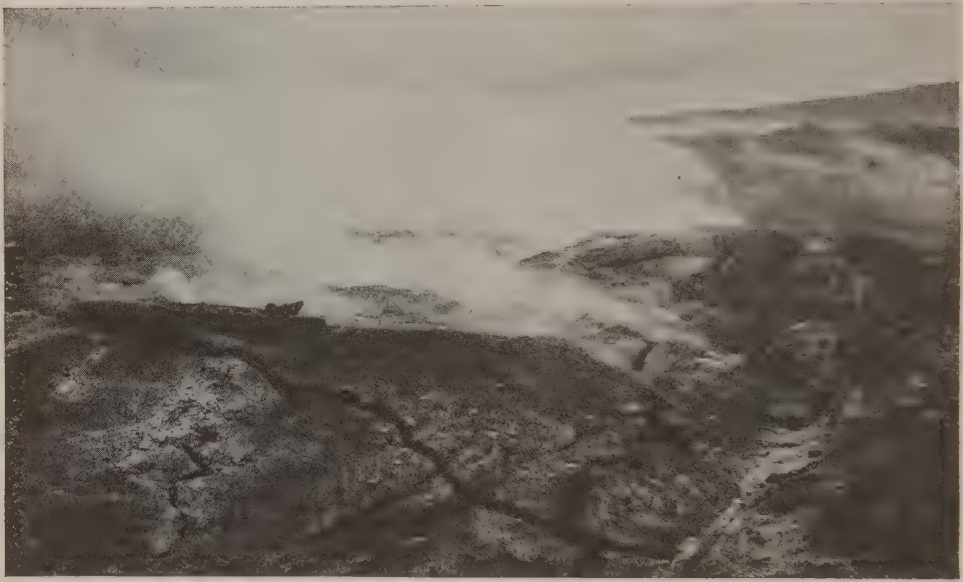
Then a brave woman, strong in faith, resolved to defy the goddess in her fastness and break the spell that bound the people. Her name was Kapiolani, and she was the wife of Naihe, the public orator of Hawaii. This was in 1825.

One day she plucked a branch of the sacred berries, which it was sacrilege for a woman to touch, and started to climb the mountain. It was a toilsome and terrible ascent of two and a half miles; very dangerous, too, when she reached the slippery sheets of lava.

The enraged priests of Pe-le came out of their sanctuary among the crags and tried to bar her way with threats, but she heeded them not. She pressed on to the summit, and then clambered down the side of the terrible crater till she stood on the brink of the boiling sea of fire.

Then she hurled into it the sacred berries, with the words: "If I perish by the anger of Pe-le then dread is her power; but behold, I defy her wrath! I have broken her orders; I live and am safe, for Jehovah the almighty is my God. His was the breath that kindled these flames; His is the hand which restrains their fury. Oh, ye people, behold how vain are the gods of Hawaii, and serve the Lord!"

Safely Kapiolani descended the mountain, having broken the power of superstition by her brave deed.



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Steam gushing from crevices on the edge of the terrible crater where Kapiolani defied Pe-le.

THE NEXT STORY OF GOLDEN DEEDS IS ON PAGE 887.

The Story of THE FINE ARTS

A famous Greek picture probably nineteen centuries old—The Aldobrandini Marriage.

ÆGEAN AND CLASSICAL PAINTING

CONTINUED FROM 297

Do you remember the story of Theseus, the Athenian prince who slew the cruel monster the Minotaur on the island of Crete? And do you remember how Ariadne, daughter of the king of Crete, gave the princely hero a clew of silk to unwind as he went into the Labyrinth so that he might find his way out again through its winding passages?

By a line of evidence as slender as a silken thread men of the nineteenth and twentieth centuries have traced their way back and forth over the Mediterranean until they have found the Labyrinth itself and taken the covering earth from buried cities, where a new story of an old, forgotten civilization can be read. This civilization and its art we shall call Ægean, and the tale of its discovery we shall tell briefly.

It all began in the mind of a little boy, Henry Schliemann, who loved to hear Homer's story of the siege of Troy, and believed with all his heart that the walls of Troy were still standing and might be seen if one could only find the place and dig deep enough. Schliemann worked hard and studied hard for years before he had a fortune great enough to give him a chance to open the earth upon the site of Troy and dig out city after city, buried one below the other. One of them was indeed Homer's Troy, where Hector fought against Achilles and died fighting. Next Schliemann turned to Mycenæ in Greece, the home of Agamemnon, leader of the Greeks against the Trojans. There he found tombs and treasuries that told of actual ancient life of ease and splendor, long lost and forgotten except in myth and song. Other places near Mycenæ were excavated and yielded more examples of the skill of those men of long-ago.

But where had been the beginnings of that ancient culture? This question was like a puzzle to be worked out. At last, about 1900, the archæologists had good reasons for believing that they had discovered the centre, perhaps the first home, of the earliest European culture, in the island of Crete. Sir Arthur Evans of Oxford, England, and others have had such success in unearthing these palaces and villas with their pottery and other furnishings that we feel as if we knew quite how the Cretans lived some four thousand years ago. And we can be sure how they looked, for the wall-paintings that are left show us men and women, alone or in groups, doing the things that were their custom.

And now, having found our way back to what seems to have been a starting-place, let us turn around and travel forward down the road of art in the old Ægean age.

We used to think that when Egypt

and Babylonia were enjoying their best days the northern Mediterranean had no life that could compare with theirs and that they acted as the teachers of southern Europe. Now we believe that the life of the Ægean world was moving along at an equal pace.

What do we know of the art of painting in Crete? From the decorations on the oldest pottery we learn that the early artists expressed themselves in symbols—made a sort of "shorthand." Wavy lines would represent the ripples on water when the wind was blowing over it. Spiral lines would stand for the twists of a shell or the coils of a tendril. It was not imitation but the record of an impression. The first pottery designs were in white on black—a kind of white chalk pressed into lines cut in the clay. Later, natural designs of grasses, reeds, flowers and sea-shapes were skillfully painted in dark colors on a light background. The crocus was a favorite motive, and so were the lily and the iris. Most characteristic of all were the sea-forms—shells and corals and fish, grouped into beautiful decorations. One jar shows two octopods with their long, reaching arms, set in the midst of other creatures of the sea—feather-stars, sea-anemones, corals and sea-urchins.

As for the paintings on the walls, they include a wide choice of subjects. In general, the outlines are fine and strong, the colors lively and interesting. In the great palace of Knossos fragments of wall-decorations give us beautiful portraits of youths bearing gold and silver cups, a procession of dancing girls, flower-gatherers, and splendid guardian griffins—far gentler scenes than the ones that pleased Assyrian and Babylonian monarchs. On one wall a blue boy is gathering crocuses and putting them into a vase. In a fragment from a villa in another place a cat is about to spring upon a pheasant.

But one theme that appears often, both in Crete and in Mycenæ and Tiryns in Greece, tells us that the favorite sport of those old sea peoples was the cruel one of bull-grappling. Young men and girls seem to have been trained to perform in the bull-ring; for the artists have painted them in the act of catching the bull's horns, or flying over the bull's back to be caught by another acrobat waiting with outstretched hands. The bull seems to have been almost a symbol: it is so often represented. In some cases it is only a head raised in relief and painted—such as the one at Knossos, extraordinarily lifelike and vigorous, which is painted brownish red with a gray horn.

And now we may have gotten at the very secret of the Labyrinth and the tale of Athens' sending tribute of youths and maidens to Crete to be devoured by the Minotaur—half bull, half human. Minos,

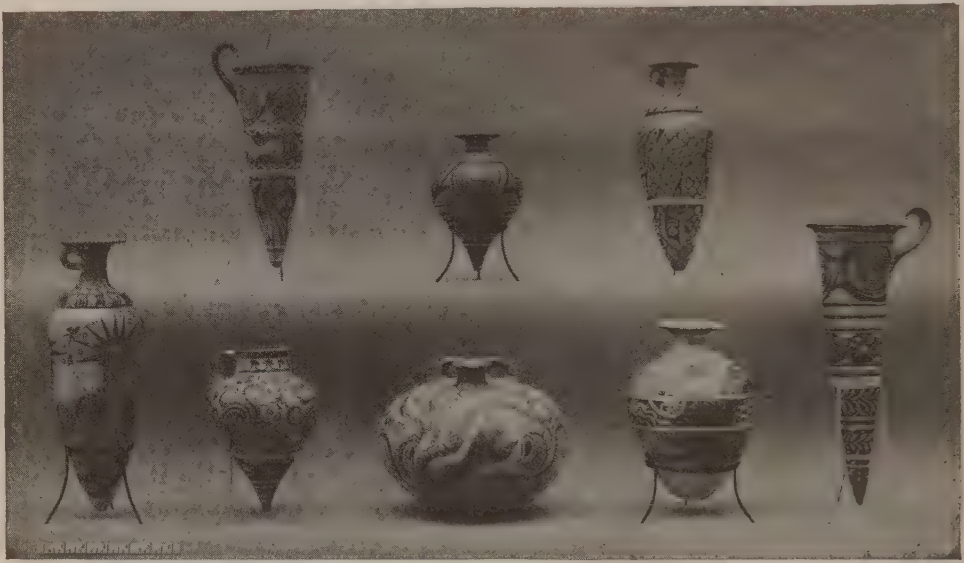


Photo The Metropolitan Museum of Art.

Cretan pottery, dating from about 1660 to 1500 B.C., which gives a variety of the favorite designs—the crocus, fishes in a net, starfish, nautilus, octopus and conventional patterns.

king of Crete, was a sea-king of great power. At Knossos was his palace, where Dædalus had built the Labyrinth, "the place of the double axes." *Labrys* was the name of the double ax, and the symbol is carved upon the walls of the palace in many places. It may be that Athens actually did send youths and maidens to the conqueror, not to be literally devoured by a monster, but to be trained for the dangerous sport of bull-grappling in the Labyrinth. When the inscriptions have been deciphered and can be read, we shall know more definitely.

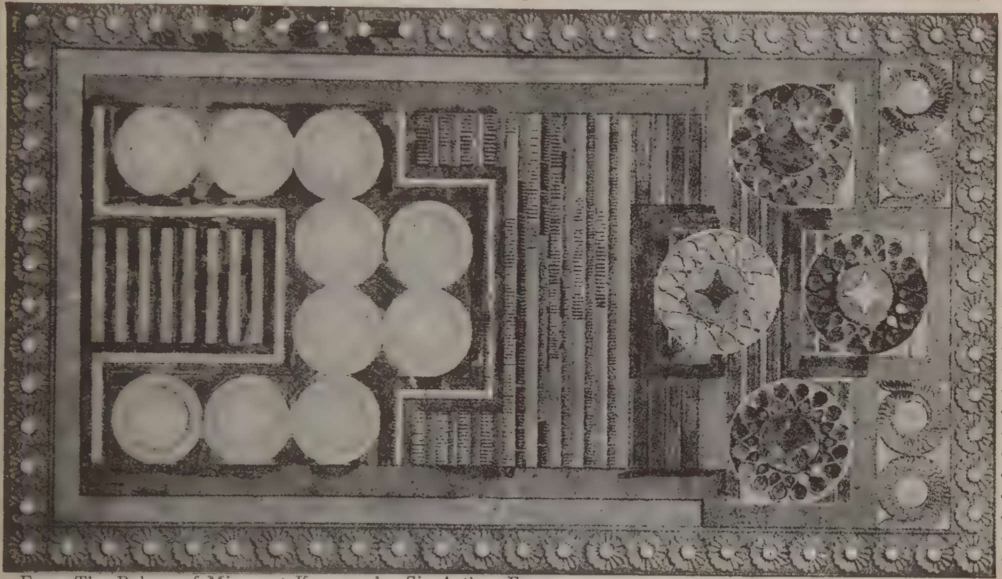
In all the frescoes where men and women are represented the men are painted with brownish skins and the women white—the artist's convention to make a distinction. The women's clothes are amusingly modern-looking, with close-fitted bodices, flounced skirts and apron panniers. Both men and women have squeezed-in slender waists. A miniature painting of a balcony scene gives an animated group of the king's courtiers and ladies apparently looking on at some game or festival. One of the things we notice particularly in the art of the Ægean age is its abounding life, its indication of activity and movement—in striking contrast to the calm aspect of Egyptian expression.

Of the great carved stone jars, used for storing food—big enough and numerous enough to have held the Forty Thieves—of the metal cups and vases and the glazed porcelain figures we shall say more when we are talking about sculpture.

The development and decline of the art we have so quickly glanced over covered some fifteen or sixteen hundred years, with its Golden Age falling somewhere around 1500 B.C. For convenience archæologists have divided the progress into periods, and called them Early Minoan, Middle Minoan and Late Minoan, subdividing each of these periods again into three others.

Probably about 1400 B.C. the great sea-power was broken. The ruins of Knossos give many evidences of having been swept by fire in some vast overthrow. Ægean culture was doomed to become a dim memory in the minds of men, and later ages had to begin to build up for themselves new kinds of civilization and art.

The invaders who flooded down across the Mediterranean coast into the peninsulas and then out upon the islands came from the north, bringing with them fresh vigor, different impulses and a new attitude toward the world. They were Indo-Europeans, and to them we owe very much; but their advance could not probably have been so rapid if they had not taken into their own lives something of the long and fruitful experience of the men they overcame. The art of Greece in the most



From The Palace of Minos at Knossos by Sir Arthur Evans.

This sumptuous game-board found in the palace of Minos at Knossos is not so very unlike our parchesi board. Its decorations are in gold and silver, ivory and crystal, and blue enamel paste.

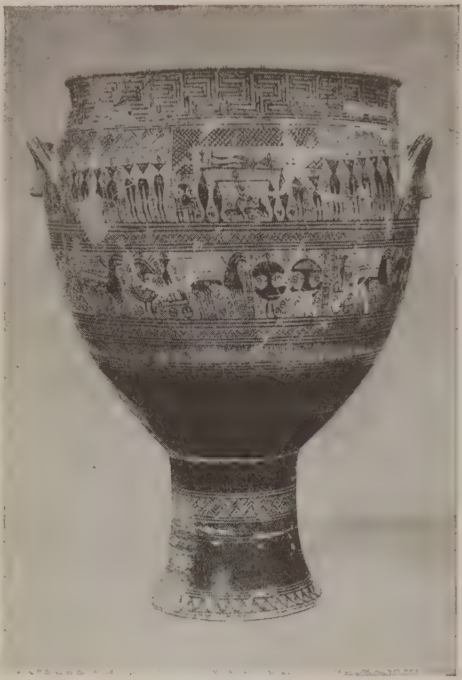


Photo The Metropolitan Museum of Art.
Large vase, Dipylon style, eighth century B.C.

brilliant days of its flowering may be traced in part to a living seed of the instinct to express beauty, which was planted far back in the time when Ægean splendor drooped and fell under the Northern sickle.

Therefore when we study the later life in Greece, in what we know as the Hellenic era, though we find a new and distinct development, we can see a trace of the old Ægean life. Hellenic art cannot be thought of as beginning earlier than 800 B.C., for from 1100 to 700 B.C. Greece was "in the making." Here, again, we examine the pottery to learn how the artists first thought and worked. The uses of the vases varied. Some are drinking-cups, some jugs, some bowls for mixing; others are jars to hold oil. And the shapes, altering as time went on, are as various as the uses. The finest are the simplest and have the severest handles.

The ornament, like the shape, varied with the passing centuries, and mirrors the rise and fall of Greek art. When the free, flowing decorations of Crete and Mycenæ had been lost sight of, there came into use a kind of stiff, geometric pattern with conventional figures in keeping with the designs. A famous set of vases belongs to this period—jars on which are painted naval battles and funeral processions. They are often called Dipylon vases, from the Dipylon (double-gate) cemetery at Athens, where many of them were found. The artists of those days were working out certain difficult problems for themselves and for all artists afterward. They had not learned perspective, so they painted all the legs of the horses in a team side by side, and both legs of a man even when he was shown in profile.

When the Greeks had traveled about the eastern Mediterranean and settled on some of the islands and the shores of Asia Minor, the influence of Oriental art began to be felt, but their native genius was strong enough to hold its own character, taking ideas and motives from the East and working them into its own creations. On the vases the severe geometric designs gave way to more interesting decorations. As the city of Corinth took the lead, the best vases of this period are called Corinthian. On them the paintings are done in dark paint on the light clay, and in this period fantastic animals and scenes from old Greek mythology began to be used.

During the sixth century B.C. there came another change in the style of vase-

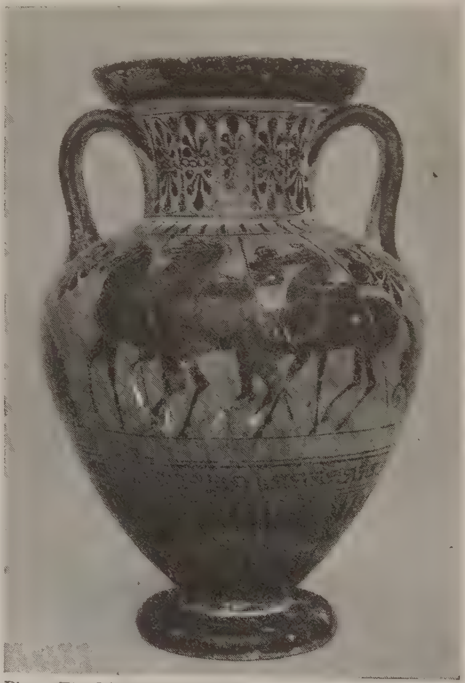


Photo The Metropolitan Museum of Art.
Amphora, with design of horsemen, 550-500 B.C.

painting. The figures were now black on a red, or sometimes on a creamy or white, background. In Athens they were developed to their best form: therefore the style is known as Athenian. Greater skill in representing figures is noticed as time brought more experience and knowledge; and artists began to claim credit for their work. Some of the Athenian vases of fine design are signed. "Nikosthenes made me," inscribed upon many a beautiful vase, tells the name of a painter who produced more pieces than any other we know. Others were Euphronios, Brygos and Douris.

Again there came a change of style when the decorators found that they could get better and more delicate results by leaving the figures in the red-clay color and outlining them with black, then painting in the background with black varnish. And now the painter, having learned full control of the lines, could make beautiful scenes with the charm of freedom and naturalness. The composition was more graceful, the figures were nobler and finer. The highest expression was reached about the middle of the fifth century B.C. After that began a gradual decline, indicated at first by more elaborate design and the introduction of more color.

Photo The Metropolitan Museum of Art.
Krater, with Dionysus and a Satyr, Athens, 500-480 B.C.

Unfortunately very few specimens of Greek wall-painting have been preserved for us, and that is one of the reasons why we treasure the vases which show the wonderful technique of brush drawing. It is very likely, too, that the vase-painters were closely influenced by the great artists of their time, whose fame is sung with eager enthusiasm in Greek writings. Some of the names we know well. There is Polygnotus, whose wall-paintings adorned public buildings at Athens and in other cities. Apelles and Zeuxis we place among the highest names upon the roll of art. But imagination must help us if we would try to feel the grace of line, the beauty of composition which we know their work possessed.

We can partly guess how great the pictorial art must have been from a famous painting called The Aldobrandini Marriage, which hangs in the Vatican Museum in Rome. There were innumerable frescoes painted by the Greek artists and their scholars, but all except those of a late period have perished. Some few were found in Egypt, and eleven of them are in the National Gallery in London. The rest we owe mainly to the excavation of the buried towns of Herculaneum and Pompeii, which were buried beneath a volcano eruption in A.D. 79 and discovered about the middle of the eighteenth century.

These two towns were by no means the home of what we should call Greek art of the high order, but they were freely and lavishly stored with art treasures executed under Greek influence. The paintings are chiefly compositions dealing with Greek mythology. There is an ancient Judgment of Paris, which has inspired many later pictures; another is Achilles Recognized by Ulysses. A great many of the frescoes were done by Roman scholars of the Greek masters.

Some of these paintings help us to realize what the work of the Greeks in their prime must have been. But the great fire of their genius had burned down, and here we see it going faintly by in thin flames.

The arrangement of the Classical collections in the Metropolitan Museum is well planned to illustrate these periods of art. In the Cretan and Mycenæan room the exhibits are, of necessity, mostly reproductions; but the Greek vases are represented by a number of fine originals, and there is an interesting example of wall-decorations in the frescoes from a villa near Pompeii, buried by the great eruption of the volcano Vesuvius.

THE NEXT STORY OF THE FINE ARTS IS ON PAGE 575.

PICTURES THOUSANDS OF YEARS OLD

An old Roman portrait.

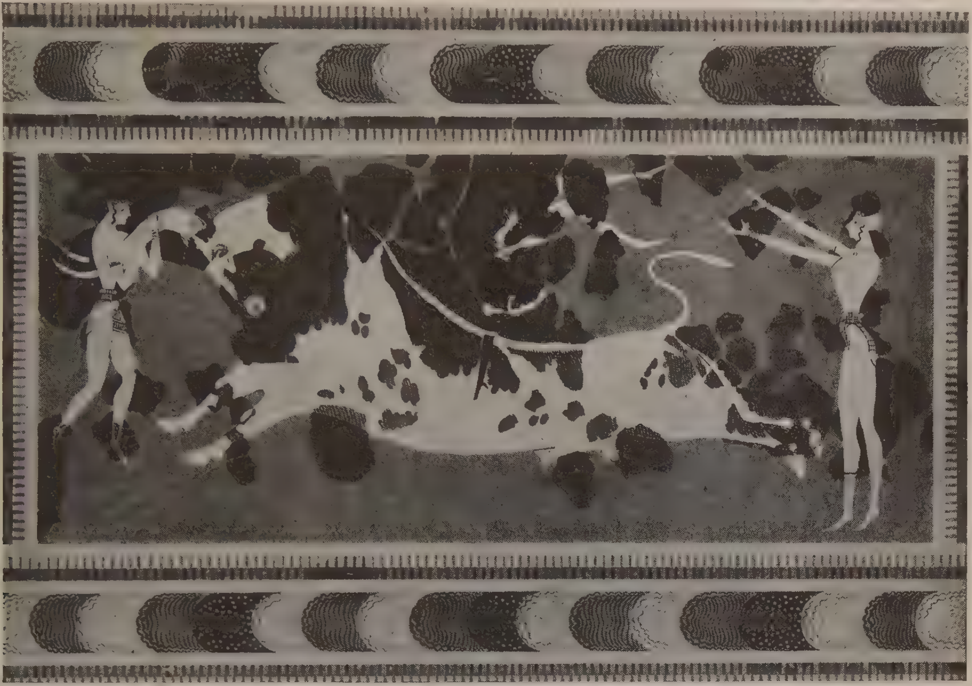
A Greek vase in the British Museum.

A mummy picture from old Egypt.

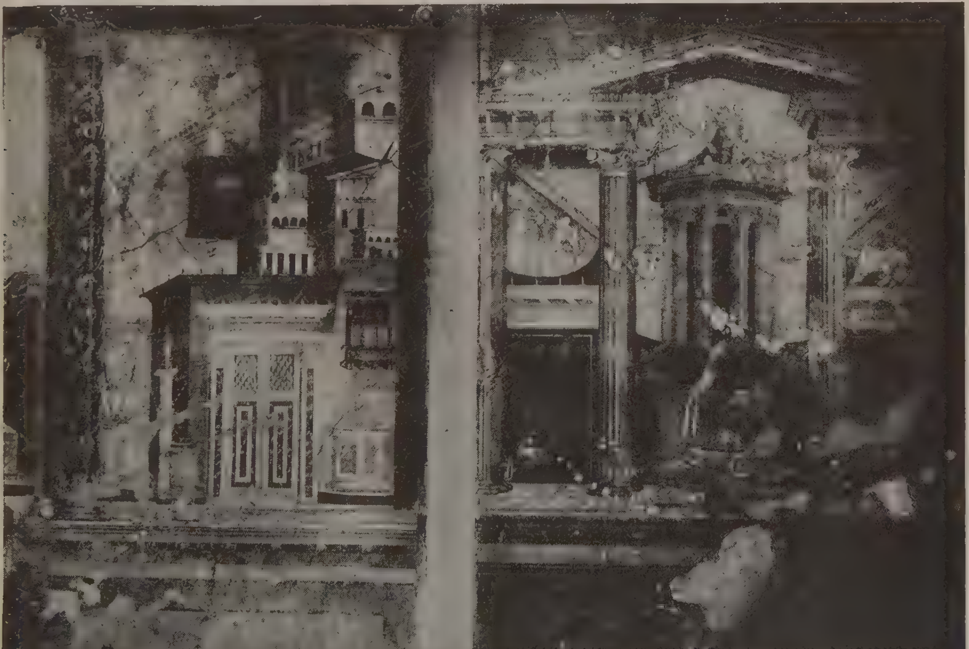
A guardian griffin from the wall of the throne room at Knossos in Crete.

Wall-pictures from Pompeii buried in the earth for eighteen centuries.

WALLS THAT TELL STORIES OF THE PAST



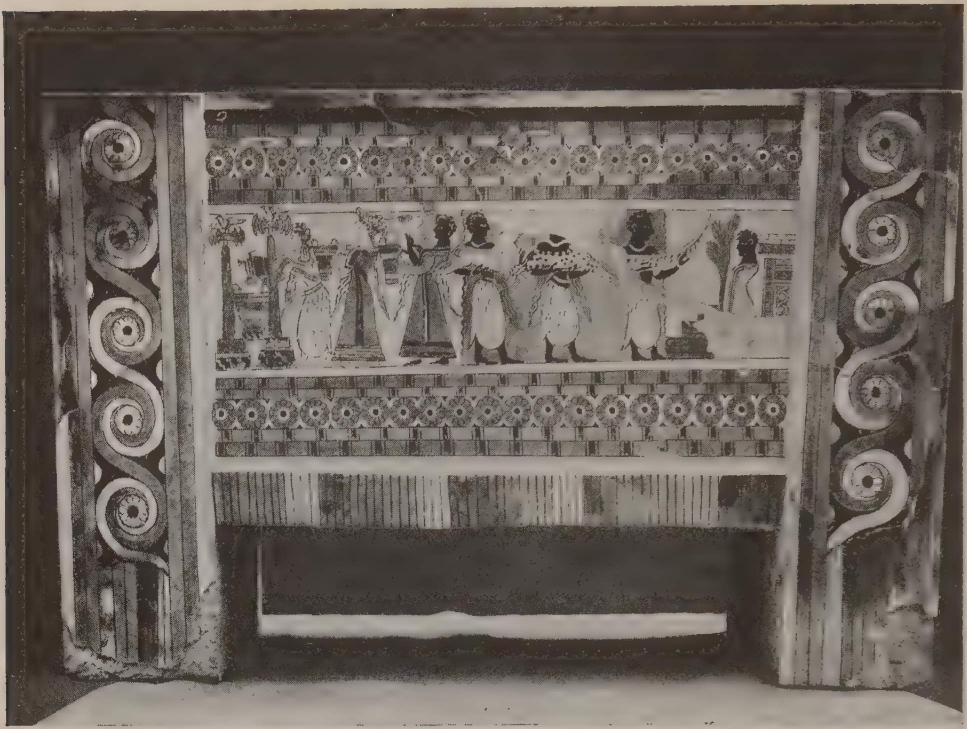
This fresco from the palace at Knossos, Crete, presents an exciting scene in a bull-grappling performance. A youth is in the midst of a somersault over the bull's back. One girl holds out her hands to him, while the girl in front is about to be tossed over after him. It is more thrilling than a modern circus act.



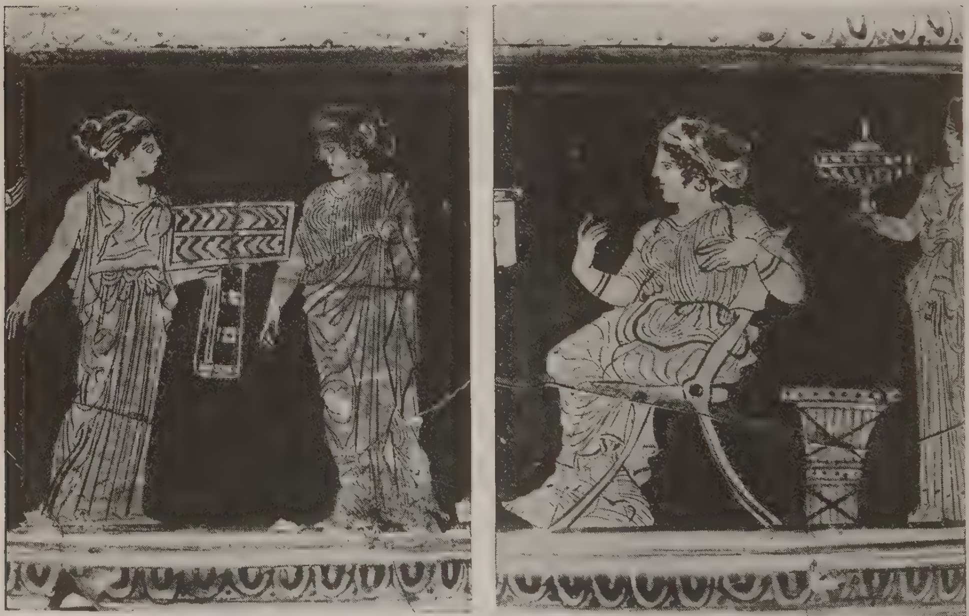
From a villa near Boscoreale, buried at the same time as Pompeii by the great eruption of Vesuvius, the frescoes of a whole room have been brought and set up in the Metropolitan Museum. This shows part of one wall, painted in an architectural design of doorways, colonnades, cornices and jutting balconies.

Photos The Metropolitan Museum of Art.

FUNERAL AND BRIDAL SCENES OF OLD



The painted panel on this sarcophagus, made of limestone and found at Hagia Triada, Crete, shows part of a funeral ceremony. We may suppose that the figure at the right represents the dead man in front of his tomb, and that the three approaching him are bearing gifts—the model of a ship and two calves. The women on the left are performing other rites. Notice the patterns of the fine decorative borders.



These scenes, on a Greek pyxis (a small covered box for a lady's toilet table), tell the story of gifts brought to a bride. The hand at the left belongs to a girl who is playfully balancing a stick on her other hand. The figure at the right holds a box on her left hand. The work is Athenian, of the period 450 to 420 B.C.

Photos, courtesy of the Metropolitan Museum of Art.

HOW DO SHIPS SAIL AGAINST THE WIND?

CONTINUED FROM 313

THERE are many ways in which man uses the wind for his purposes. He erects a windmill with sails, and the wind drives these round and round, working a machine that will grind the corn or pump up water. Man also uses wind for drying his clothes after they have been washed.

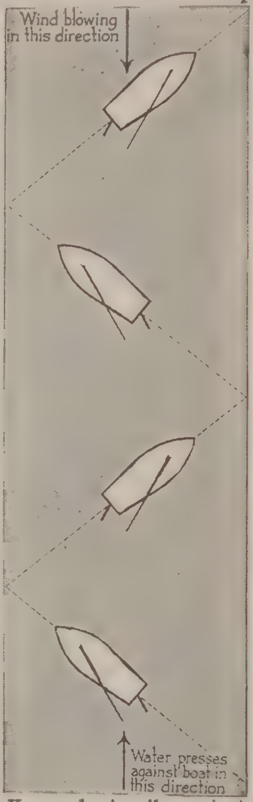
But the chief use to which he puts the wind is transport. This was, no doubt, one of the very first ways in which he made use of the wind. Both on land and water for thousands of years vehicles and vessels have been driven by the wind. The wind was, indeed, one of the first natural forces man ever used. Despite the discovery and application of steam and electric power and the invention of the gasoline motor, the wind still is, and always will be, used in certain circumstances on account of its cheapness. It does not have to be prepared like steam, or harnessed and directed like the waterfall. It is there blowing ready for use, and no special apparatus beyond a sail is necessary. As a matter of fact, the wind cannot be harnessed, for, as Jesus said to Nicodemus: "The wind bloweth where it listeth."

But, though it may blow continuously in one direction, man is not at the mercy of the wind; he is not compelled to go just where the wind happens to be blowing at the time. By using his brain he is able to change the position of the rudder of his boat and catch the wind in such a way that he can use it to drive his vessel in the opposite direction from that in which the wind is blowing.

This is done by a process known as tacking. The diagram on the next page helps us to understand how this wonder is performed. When he wants to drive his boat in the teeth of the wind, the sailor turns his rudder and sails a zigzag course. The boat is turned by means of the rudder, so that its side is presented to the oncoming wind. This would drive the boat before the wind, but the resistance of the water on the opposite side prevents this. The vessel therefore takes the line of least resistance—that is, it follows the easiest path and goes in a slanting direction, as indicated by the dotted line in the diagram. When the rudder is turned and the boat changes its direction, the sail is swung round by the wind. In the diagram we are looking down on the boat, and the long line shows the position of the sail and the short line at the stern the position of the rudder.

After going for some distance in this direction the rudder is changed, and the boat turns round and takes a slanting course in the other direction. By doing this repeatedly, and tacking from side to side, the boat eventually reaches its haven. To learn to tack, or to beat up to windward, as it is called, is one of the most important things a sailor has to learn. Men become very skillful in making use of the wind in this way.

HOW IS THE WIND USED FOR LAND TRANSPORT?


Wind blowing in this direction
Water presses against boat in this direction

How a boat sails against the wind.

The wind is for sailing not only on sea, river and lake, but even on land. In Canada and the United States, and to a less extent in Norway and Sweden and Finland, ice-sailing is a favorite sport. Special yachts are built consisting of a triangular frame mounted on two steel runners, and having a tall mast with sails, usually a mainsail and a jib. The sails are set, and as soon as they are caught by the wind the yacht is blown at a very high speed over the slippery ice. The craft is guided by a long steel rudder, and the speed attained is sometimes eighty miles an hour. Some of these ice yachts carry as many as eight passengers.

In some parts of the world wheeled vehicles running on railway tracks are driven by the wind, and in China thousands of natives raise a sail on their barrows and so use the wind to help them in pushing heavy loads from place to place. The sail-barrow of China is a very old institution, and it is rather surprising that the idea has not been generally copied for simple land transport in some other parts of the world where the wind blows steadily.

HOW ARE THE CARTOONS MADE FOR THE FILMS?

This is a question often asked when the humorous cartoons are shown at the pictures, and few people realize the great amount of work that is entailed in the making of these films.

Normally a film camera takes sixteen photographs each second, a foot of film being exposed in that time. When the film is being projected it is shown at the rate at which the exposures were made, and the figures appear to be moving naturally on the screen. Although film cartoons are projected at this rate, they cannot be produced as quickly as ordinary film pictures, for what is shown on the screen as a living picture is actually a series of drawings made one by one and photographed in their proper order. In a film 400 feet long there would actually be 6,400 pictures photographed. If all these pictures had to be drawn separately and completely it would take an artist several months to complete one film, but this is not the case. It must be remembered that in this type of film the same background is very often used for a considerable part of the action, and only the characters—perhaps only parts of the characters—move. Let us take as an example a film of a man standing on a cliff, pointing out to sea. On a sheet of pyralin, a transparent substance with the appearance of glass, a drawing of the scene is made, complete with the figure of the man minus the arm that is to move.

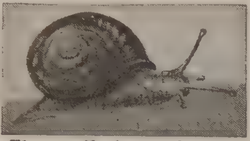
Several sheets of paper the same size as the pyralin are prepared, and on each of these the artist draws a sketch of the arm alone, the second drawing showing the arm raised a little more than the first, and so on. The first sheet of paper is then placed in a frame under the sheet of pyralin. The pyralin being transparent, the arm can be seen plainly as part of the figure, and the whole is then photographed. The first sheet of paper is then removed, and the second takes its place, another photograph being taken. This slow process is repeated time after time until the action moves to another scene, when a fresh background is prepared on another sheet of pyralin. Perhaps in the next scene the whole figure is to move about rapidly, in which case a separate figure has to be drawn on each sheet of paper before being placed beneath the pyralin to be photographed.

It is not always possible to take advantage of a stationary background in this way, and in that case it is necessary for a separate drawing to be made of each picture, a long and costly process.

CAN ANY ANIMAL LIVE FOR YEARS WITHOUT FOOD?

A distinguished scientist of the University of Cambridge describes a very small creature known as the tardigrada, a distant relation of the spiders and popularly known as the water-bear, which can dry up till apparently all life is extinct, and after remaining in that condition for years, can, with the aid of moisture, revive and live its normal life once more.

These creatures live naturally in a damp atmosphere, but if the atmosphere becomes dry they also dry up. All movement gradually ceases, the body shrinks until it looks like a battered grain of sand, and thus it will remain year after year, to all appearance dead. If placed in water, however, in a few minutes it will swell out, the wrinkles will disappear, the legs will stretch out, and gradually it will move. In an hour or so the creature is as active as ever, and crawls away.


The snail that woke up.

Some of the snails, too, can remain apparently dead for years without food, and then revive and live as though nothing had happened to them. The most striking example of this was a desert snail from Egypt, supposed to be dead, which was fixed to a tablet in the British Museum on March 25, 1846. On March 7, 1850, it was observed to have awakened from its long sleep and come out of its shell. It was removed from the case and lived for a considerable time.

WHAT IS THE BOOK CALLED THE NAUTICAL ALMANAC?

It is an almanac prepared specially for navigators and astronomers, with tables showing the daily positions of all the bodies of the solar system, the places of the fixed stars, predictions of forthcoming astronomical events, and other similar information. Nautical almanacs are issued by the governments of Great Britain, the United States and other nations.

The most famous is the British Nautical Almanac, first prepared in 1767 by the Astronomer Royal, Dr. Maskelyne, and published with the authority of the Government. After Dr. Maskelyne's death the almanac was still issued, but it became less accurate and efficient, and there were many complaints about it.

The first number of the new series was issued in 1834 by the Admiralty, who have been responsible for it ever since. It is issued four years in advance of the year to which it refers, and is an exceedingly important publication.

DOES SOUND ALWAYS TRAVEL AT THE SAME RATE AS THROUGH AIR?

No; the lighter the gas the faster the sound travels through it, if the pressure and temperature are the same. If the air we breathe were hydrogen, instead of being a mixture of nitrogen and oxygen, we should hear a clap of thunder much more quickly than we do. If a storm is four miles from us we hear the thunder about twenty seconds after we see the lightning, but if the air were hydrogen we should hear it about five seconds after the flash.

Here are the speeds at which sound travels in different gases when the temperature is at 0 degrees Centigrade, and the pressure is the same as the atmosphere at normal times: hydrogen, 4,163 feet a second; air, 1,090 feet a second; oxygen, 1,041 feet a second; carbon dioxid, 856 feet a second.

HOW DOES A FLY WALK ON THE CEILING?

This is a thing that has puzzled men for a very long time, and even now it is not quite certain why the fly can do what we cannot do—walk upside down across the ceiling. When the foot of a fly is seen through the microscope two membranes, or cushions, can be noticed, and these are covered with tiny hairs, each with a disk at the end. It is these disks which enable the fly to walk on the ceiling, but exactly how they work has never been settled.

Some scientists believe the disks act as suckers, and that when a fly walks on the ceiling a vacuum is formed between the disk and the plaster, and the insect is thus held up by the pressure of the air. Against this theory, however, is the fact that when the air is drawn out of a vessel in which the fly is walking upside down, the insect does not fall off.

Other scientists who have studied the fly carefully believe it is able to hold on by means of a sticky substance coming from the under side of the foot. Each hair would seem to be a tiny tube for conveying this liquid from the little pouch in which it is produced, pouring it out as required.

ARE THERE ANY DIAMONDS IN THE SKY?

The old verses speak of a star twinkling "like a diamond in the sky," and there seems little reason to doubt that there are diamonds in the sky. Small diamonds have been discovered in meteorites both of stone and iron. Two Russians who examined a meteorite which fell on September 22, 1886, near Novo-Urei, in the southeast of Russia, found that it contained about one per cent of diamond. Diamond has also been found in a meteorite stone at Carcote, in Chile, and in an iron meteorite discovered at Devil Canyon, Arizona; and much of the meteoric iron in Arizona contains diamond. The fact that diamond crystals have often been discovered in meteors which have fallen to earth led to the suggestion that all diamonds came from the skies, but we know this is not so. The diamonds that are found in various parts of the world, often deep in the ground, are generally believed to be due to crystallization of carbon, which has been dissolved under enormous pressure in molten iron, and thrown up toward the surface of the earth from great depths, probably by volcanic action.

CAN ANY PLANT GROW UNDER ICE?

This is very often done by an interesting little Alpine plant called the soldanella. During the summer the flat leaves are exposed to the sun and the plant stores up fuel in the leaves until these become quite fat. Then, as time passes, they flatten to the ground, and when the snow falls the hard, leathery covering of the leaves protects them from damage.

The plant sleeps through the winter, but in early spring the water trickling through cracks in the frozen snow above gets round the root and causes the plant to germinate. A little bud begins to open and, using the fuel stored up in the leaves, melts a place for itself in the frozen snow or ice.

As it grows up toward the light it continues to melt the snow, until at last it emerges into the fresh air, but down below the snow again freezes together round the stem. The flowers open, and when the snow disappears the little soldanella is practically a full-grown plant with its blossoms open inviting the bees to enter and fertilize them. The bees accept the invitation, and fruits form, yielding seeds. The plant then flattens again to the ground and stores up fuel for the following year.

If the soldanella were to wait for the snow to disappear before it began to grow it would have little chance of surviving, for there are crowds of other plants all round that would overtop it, shut out the sunshine, and prevent its blossoms from opening properly. By melting its way through the ice and blossoming before the other plants have grown, the soldanella preserves its life and produces seeds which grow and carry on the race.

IS EVERYTHING A PART OF NATURE?

Certainly everything is a part of nature. All truly great men, ever since men began to think, have known this. An English poet has said that all things are

> Parts of one stupendous whole
> Whose body is Nature and God the soul.

That was said by Pope. A later poet, Wordsworth, has written these lines, among the greatest in all our poetry. He says that he sees in nature something

> Whose dwelling is the light of setting suns,
> And the round ocean, and the living air,
> And the blue sky, and in the mind of man:
> A motion and a spirit that impels
> All thinking things, all objects of all thought,
> And rolls through all things.

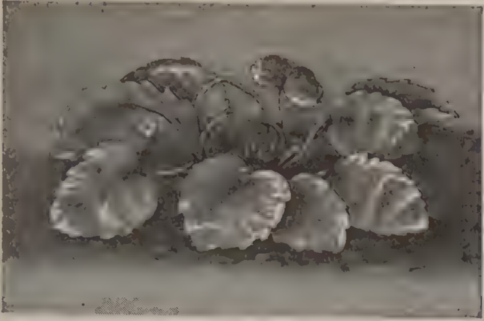
Thousands of years before Pope or Wordsworth the great Indian thinkers saw the same truth, and said, "the real is one." The laws of nature and the laws of life apply to man and to all known —and unknown—things, and the more we learn the surer we are that we are right when we call the whole of nature the universe—a thing that moves as one because it is a whole of which everything existing is a part.

DO WE SEE THINGS IN THE DISTANCE, OR THE LIGHT THAT COMES FROM THEM?

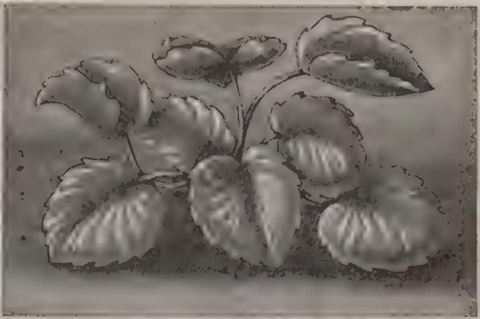
What we see is the light that has bounced from things or has been made by them if they are luminous things, and we see it, of course, in our eyes; or, to be accurate, at the back of our heads, in the part of the brain where we really see. Actually we feel as if we see things where they really are, but it is now proved that this is the result of practice and experience, and the knowledge which we have got by walking about and touching things.

A baby, when it begins to see and use its eyes, has no idea of distance. Its very first impressions, we can be sure, are

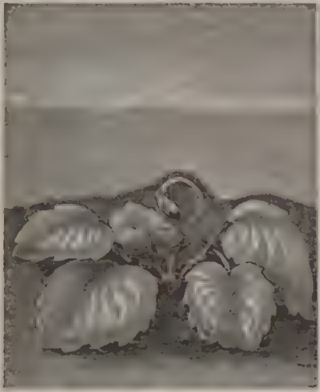
HOW A PLANT MELTS ITS WAY THROUGH ICE



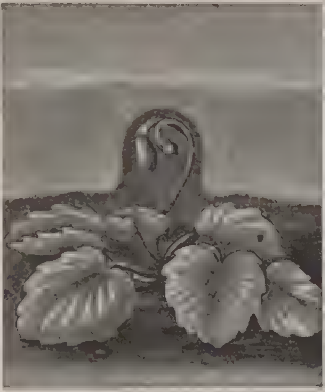
1. The little Alpine soldanella is a wonderful plant which grows high up in the Alps. In summer its leaves are flat.



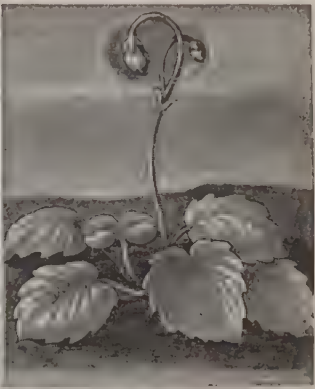
2. As autumn advances the leaves take in carbon and hydrogen to store up as fuel, and they become fat, as shown.



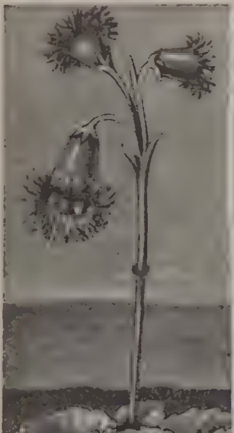
3. In winter the plant is covered with snow and ice, but in spring the growing bud begins to melt the ice above it.



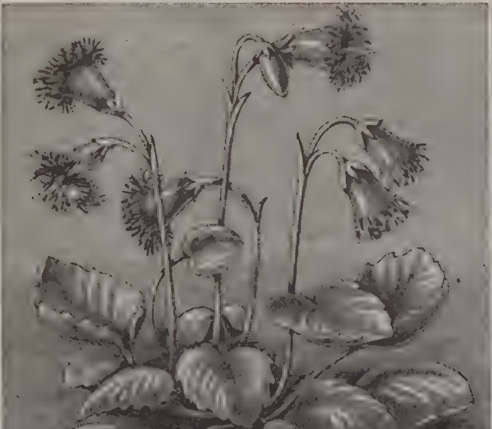
4. Slowly it grows upward, melting its way through the ice by means of energy which is stored up in the leaves.



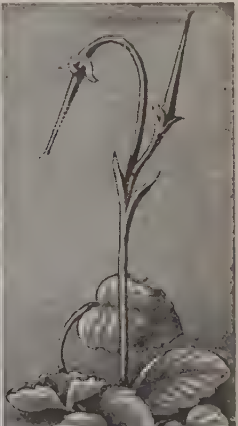
5. At last it melts its way out into the open air, but meanwhile the snow below freezes again round the stem.



6. The flower, opening in early spring, is fertilized by the bee, as shown here.



7. Here is the complete plant in full blossom as it appears soon after the melting of the snow. It will be seen that the leaves are no longer flattened and close to the ground.



8. After fertilization beak-like fruits form, the seeds fall, and new plants grow from them.

of something in itself; then, as it discovers its own body, and uses its fingers, it learns that the things it sees are outside itself. Yet even then, for a long time, the baby will reach out its hand to things that are as far away as the moon.

WHY DOES A FINGER LOSE ITS FEELING WHEN IT IS NUMB?

The nerves of the finger end in the skin in a number of highly sensitive organs. The action of the ends of nerves and the organs at the ends of them depends very much upon their temperature. That is probably the chief reason why, in the higher animals, the temperature is fixed instead of moving up and down with the surroundings.

When nerves are made cold—as when the finger is numb—they cannot receive impressions at their ends, nor conduct them if received, and so we do not feel. This can often be applied when we wish to make a little cut, or something of the sort, in a finger, or some other part of the skin. If the operation is slight and quick, it seems a great pity to make the person unconscious so as to avoid pain, and it is much better merely to numb the part of the skin in question.

WHY IS SO MUCH OF NATURE GREEN?

Wherever life can find a footing there we find it. It varies in a thousand ways, but we find it almost everywhere. It is limited, and largely decided by the food supply; and thus we find it most abundant where the food supply is most abundant and the temperature suitable.

The distribution of living things depends on the distribution of the kind of food they live on. If that is widely distributed, so are they; if the food is not widely distributed, neither are they. Of all the possible foods for life, by far the most widely distributed is carbon dioxid, as that occurs in the air, and so is to be had wherever the air is. Therefore, a widely distributed kind of life is that which is capable of feeding on carbon dioxid and the only kind of life which can do this is that which produces the green substance called chlorophyl—one of the most important chemical compounds in the world.

That is the reason why so much of nature is green. And if we know the relation of the green plant's life to our own we should learn that there *must* be a certain amount of green life in nature, if we are to live. At present we destroy green fields and cut down green trees without any thought; but much of nature must always remain green, unless man learns how to use the carbon dioxid of the air as the green plant does.

HOW IS IT THAT MINERS ARE NOT KILLED BY BAD AIR?

The air of many a fashionable shop, or of hundreds of thousands of bedrooms every night, is far worse than that of many mines. Ventilation is one of the great problems of a coal-mine, and one of the very first that must be attended to. Year by year we go on cutting the coal away, and thus the miner has to go farther and farther away—perhaps a mile or more—from the mouth of the mine; but wherever he goes a sufficient supply of air must go with him. The problem is made simpler because electricity is now generally used for lighting mines; and so the oxygen that would otherwise be used up is saved.

Failure of proper ventilation is largely responsible for explosions in coal-mines, and possibly, also, for other accidents, through the bad effect of foul air on the mind, the watchfulness and the care of the miners. Since it became known how important ventilation is in this respect, the standard has been much improved. One plan is to carry liquid air down in case of accident, where no one could say what kind of atmosphere might be met in an attempt to save workers.

WHAT BECOMES OF THE SMOKE WE SEE?

Smoke is made up of a large number of different things, solid and gaseous. The solids are generally too large to stay in the air, and so, after a time, they settle. There is a lot of oil made when coal is burned, and so the black particles of carbon found in smoke are oily, and that is what helps to make them so dirty. Some of the gases are already quite burned when they pass off in smoke, such as carbon dioxid, and we know what happens to carbon dioxid in the air—whether it has come from our lungs or from a furnace. It is used up by the plants.

Other gases in smoke are not completely burned, and they get burned up in the air, forming more carbon dioxid, and also water-vapor, one of the things made by the burning of the hydrogen of coal, and therefore always present in smoke.

WHY ARE THERE SOME ILLNESSES THAT WE CANNOT GET TWICE?

This is one of the greatest questions in science to-day, and many very clever men are trying to find out the exact reason why we never suffer twice from certain diseases; in other words, how it is possible for people to become immune, or free from these ailments. There is no doubt of the fact that when people have had smallpox or measles or scarlet fever once, they very seldom suffer from them again, even if there be an epidemic all around them. In some way or other the tissues of the body have become changed as the result of the first attack, and are better able to resist that particular kind of infection. Some people think our bodies have become accustomed to that infection, so that it does not infect them any more; but, whatever the exact nature of the resisting power is, there is no doubt it is a very common process in many parts of our physical nature.

WHAT IS THE SECRET OF A FLOWER'S POWER TO GROW?

All living things grow at some period or other in their lives, and the secret of growth is part of the secret of life itself, which men have not yet found out. So it is possible to answer this question only in part.

We can say what are the conditions without which the flower is unable to grow. It must have light, water, air, and certain salts containing certain elements dissolved in the water which is sucked up by the roots. If these conditions are granted, the plant will obtain for itself the materials needed for building itself up. Not much can be said beyond this.

All we know is that there is something in the life of the rose plant that determines that the flowers it bears must be roses and not lilies or wallflowers. Nor will any kind of outside change cause anything but a rose to be produced by the rose plant. The cells that contain the life are so made that the flowers are true to type.

The same is true of every kind of animal and plant. Each has its own structure and will grow in its own special form. Exactly the same food may be given to the rose, the lily and the acorn, and they will grow to be what they must. Exactly the same milk may be given to Marjorie and to Marjorie's kitten, to Tommy and to Tommy's puppy, and each will grow to be what its nature demands.

WHAT DOES THE NAME ENGLAND MEAN?

The name England was made in Germany. The island was invaded in the past, and among the most important of its invaders were a tribe of people from North Germany called the Angles. They settled mainly in the south part of Britain, which they called after themselves Angleland, or, as we now say, England.

The Angles form only a small fraction of the source of the English nation. The country gained, no doubt, in the long run, from all its invaders. In the English people to-day there are represented, not only English, in the strict sense, but also Saxon, Danish, Norman and Roman blood.

SHOULD WE LIKE ONE FRIEND MORE THAN ANOTHER?

Human life goes on best by each of us devoting most of his love and his powers to some few people. Certainly we ought to like one friend better than another, so long as we like that friend for the right thing. If one has more love and tenderness and faithfulness and honor than another, we do wrong not to love him or her for these things more than we love someone else who has less of them.

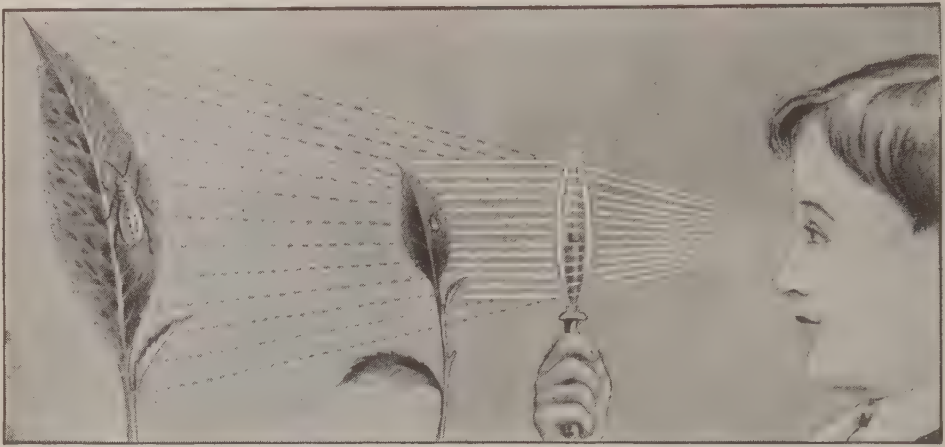
It is right that love should be rewarded by love, and cheerfulness by cheerfulness. The very fact helps and encourages people to show their best side to the world. One of the most important facts in our lives is that our qualities call forth the same qualities in other people. The loving mother makes loving children; and cruelty generally breeds cruelty.

ARE MICROBES NECESSARY TO PRODUCE CREAM?

Strictly speaking, microbes do not help to make cream. Cream is in milk at the moment it leaves the cow. All that happens to it afterward is simply a change of place. At first its globules, as we call the drops of fat, are mixed through the milk; but as they are lighter than the rest of the milk, they rise to the surface by degrees, and form a separate layer.

But in the making of butter and cream cheeses, microbes are added to turn the milk and cream sour. The flavor of the butter or the cheese depends on the kind of microbe which has been added. Some dairies cultivate special microbes so as to obtain special flavors. This is especially true in the large establishments which make several brands of butter or cheese.

HOW A MAGNIFYING GLASS MAKES THINGS BIGGER

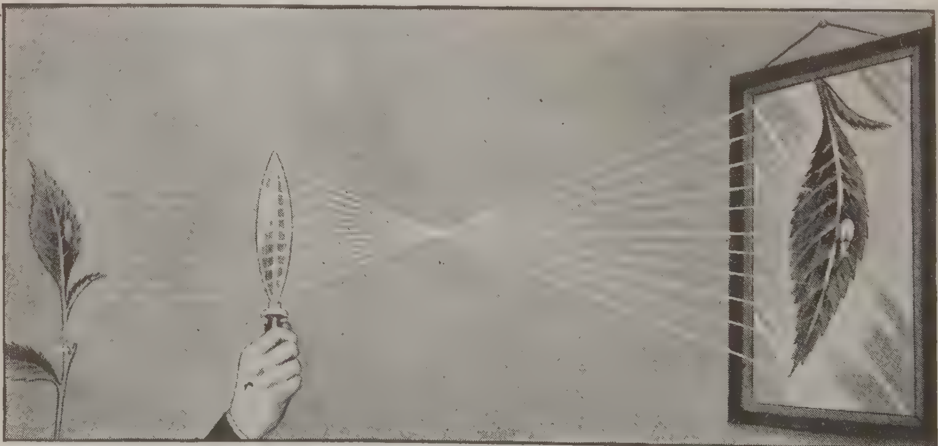


THESE pictures show us how a magnifying glass makes things appear larger than they really are. What happens when we look at, say, a leaf, is that rays of light are thrown off by the leaf and brought together to our eyes.

When we use a magnifying glass the rays of light pass through the glass and bend, as a stick appears to bend when put in water. When the rays of light reach the eye, the eye imagines that they have come in straight lines, and it appears to the eye that the light comes in lines, as shown by the dots in this picture. What we really see are rays of light. These rays, not being able to go straight through a magnifying glass as if it were a piece of ordinary glass, are bent in passing through the glass, and what happens then is as if the eye, having collected all these rays to a point, throws them out again in straight sloping lines, at the end of which we see the image bigger than it really is.

So that what we see through a magnifying glass is not the actual leaf, but the rays of light thrown off by the leaf, first bent by the glass and then apparently straightened so as to appear to cover a much bigger space. A curious thing happens if the rays of light are allowed to continue beyond the eye instead of being focused by the eye. We can do this with the aid of a mirror, as shown in the bottom picture. In this case we see the leaf upside down. This is because the rays of light meet, and then, as the rays must go straight, the line of light coming from the top of the leaf goes down, while the line coming from the bottom of the leaf goes up.

In the top picture the meeting, or focusing, of the lines of light takes place *inside* the eye, but in the picture below we see the rays focused through the glass instead of inside the eye, and continuing so that the image is reflected upside down in the mirror.



WHY DOES GLUE HOLD WOOD TOGETHER?

Glue is one of the substances which, when heated, change their form gradually from the solid to the liquid, and not instantly, as ice melting to water. It is what men of science call viscous; that is to say, it is, for a time, only imperfectly fluid, and does not flow very quickly.

When we smear the surface of a piece of wood with glue in the semi-liquid state, and place another piece of wood on top, the glue is forced into the hollow air spaces of the wood, and as soon as the glue cools and hardens it is firmly anchored in each piece of wood, and the adhesion of the molecules of glue holds the whole structure together. The glue does not penetrate the cell walls of the wood, but merely enters the exposed openings of the cell cavities. When a section is cut through two pieces of wood glued together, and examined under the microscope, it will be seen that the glue has filled the exposed pores of both pieces of timber. The more cavities in a piece of wood, and the larger the cavities are, the more easily it can be glued. Thus basswood can be glued more easily than oak. Woods having a fine texture, and a large proportion of cells with very small cavities, are the most difficult to glue.

HOW DID THE ROMANS MEASURE DISTANCE?

A Roman mile consisted of 1,000 double paces, or, in Latin words, *mille passuum*. Our word pace means the distance covered by each foot in succession—that is to say, from 30 inches, as laid down in drill-books for marching purposes, to 33 inches or even more. But the Latin word *passus* meant the distance between the point where the foot left the ground and the point where the same foot again came down in marching, or about 5 feet. Thus the Roman mile was considerably shorter than our mile—probably about 1,620 yards as compared with 1,760 yards.

The discovery in modern times of the precise length of the Roman foot is not without interest. An Italian archæologist named Luigi Canina, who lived from 1795 to 1856, in the course of his researches into the subject measured very carefully the Antonine and Trajan columns in Rome, and found them—exclusive of their pedestals—exactly the same height. This height was known to be 100 Roman feet. Measuring chains of this precise length were then made, and with these the Roman miles were carefully measured off for twelve miles down the famous Appian Way. The correctness of the measuring chains was checked by the fact that the end of each mile, as measured off, corresponded with the traditional sites of the old Roman milestones.

HOW MANY BOOKS ARE THERE IN THE WORLD?

Basing his conclusions on the most reliable data available in library catalogues, a librarian has estimated that the total number of titles of books published since printing was first invented is 16,500,000. Of some books, of course, only a few are printed, but of others hundreds of thousands, and, as in the case of such books as the Bible, the Prayer Book, Pilgrim's Progress, Robinson Crusoe, millions have been printed.

It is impossible to say how many actual copies of the sixteen and a half million titles have been issued, but, supposing the average edition to be only 3,000, the number of books issued from the printing presses of the world has been something like fifty thousand millions.

Perhaps the most astonishing fact about these statistics is that 4,400,000 of the titles have been issued in the present century, since 1900. That is to say, in the four centuries and a half following Gutenberg's invention of printing, only three times as many books were written and sent to the press as in the quarter of a century since 1900. The librarian who has compiled these interesting figures believes that only about 20,000 of all the works are of real and lasting value.

WHAT DO WE MEAN WHEN WE SPEAK OF SIZE?

All words such as size—great and small, long and short, and so on—are what we call *relative* terms. They mean that a thing is huge or tiny compared with something else. Compared with an atom, the smallest of living cells is huge; compared with a cell, our bodies are huge; compared with our bodies, the earth is huge; compared with the earth, the sun is huge; compared with the size of the visible universe, the sun is tiny; and the whole size of the visible universe, across which it would take light thousands of years to travel, is almost nothing compared with the size of the infinite universe beyond.

THE NEXT WONDER QUESTIONS ARE ON PAGE 583.

LIVINGSTONE'S LAST JOURNEY

Livingstone, falling very ill, begged his faithful followers to build him a hut to die in. "I am very cold," he said; "put more grass on the hut." In the morning they found him kneeling, dead. They carried his body to the ship which was to bear him home for burial in Westminster Abbey; but his heart was left in Africa, buried beside the tree under whose branches he died. There a stone monument now stands.

Sir H. M. Stanley.

James A. Grant.

Emin Pasha.

John H. Speke.

Sir R. F. Burton.

Sir Samuel Baker.

Hugh Clapperton.

Mungo Park.

James Bruce.

Robert Moffat.

THE EXPLORERS OF AFRICA

CONTINUED FROM 288

NOTHING more romantic has ever been imagined than the sober history of Africa. This land—the home of Hannibal, of Ptolemy and of Cleopatra, containing the greatest seat of ancient learning—has remained almost down to the present time the mystery land of the earth. Though its northern shores stared across a narrow sea at Europe, and one might march dryshod from Kamchatka to Cape Town, this continent, ancient home of myriads of people, was an unknown land far longer than America.

Hannibal, from his home on the North African coast, dreamed of conquering Europe, but never thought of even knowing Africa. Cleopatra had no desire to rule over it; the Greeks never penetrated its inner lands; Rome made no serious incursions into it; and the scholars of Egypt knew only the fringe of it washed by the Mediterranean Sea. Their palaces and temples, pyramids and sculptures dotted its foreshore and lined its one known river—the Nile—but the rest of the continent might not have existed for all the ancient world cared.

Necho, king of Egypt, as we have read, sent an expedition of Phœnician mariners right around its coast, 600 years B.C., and possibly the same adventurous race obtained from some African port the gold for Solomon's temple; but twenty-one centuries passed, and Columbus had more than once crossed the Atlantic, before any voyager repeated the Phœnician voyage round Africa.

It is true, the ancients knew of Africa's huge manlike apes, and its tiny apelike men, the Pygmies, whom no modern man believed in till late in the nineteenth century. Hanno the Carthaginian, voyaging along the western coast, saw, described and named the gorilla. But when, 2,000 years after Hanno, Andrew Battel, a British sailor, who had been a captive for eighteen years in Africa, came home and described the African man-beast he had seen, he was denounced as untruthful. Another 200 years passed, and Du Chaillu actually brought the bodies of gorillas out of Africa; but he, too, was doubted. Yet the gorillas and the Pygmies were there all along, with giraffes, okapis, hippos and antelopes, peculiar to this great continent. They were first known of there, as was the ostrich, and casual visitors, seeing them and seeing also stalwart man-eating negroes, were naturally horrified. They fled, warned others of these dangers; and all the world kept away.

The terrors of reality grew into something even more fearful through grim exaggerations—tales of evil spirits, tales of a belt of fire through which it was impossible for human life to pass. Even when Da Gama had sailed round the continent, and it became the practice to visit the African coast on west and east, grave mariners, whose names figure in history, trembled. They would kneel and pray to God that the magic of the savages whose shores they were approaching might not enchant the little ships to their doom beneath the tropical African seas.

There was, of course, a natural barrier parting the north from the interior. The great Sahara Desert stretches as a kingdom of desolation south of Morocco and Algeria and west of Tripoli and Egypt. It was a good excuse for those who did not wish to travel south overland, for it was filled with strange fierce beasts and credited with spirits most fell.

THE GOOD EXPLORERS AND THE BAD EXPLORERS OF THE LONG AGO

The early explorers were of two kinds: simple priests who went with incredible daring into realms of benighted savagery to baptize men, women and children whose very language they did not know; and Spanish and Portuguese slave-dealers who, by the middle of the seventeenth century, were carrying 10,000 poor wretches a year from Africa to Brazil alone. There, toiling like beasts of burden, the unhappy creatures, if exceedingly strong and equally fortunate, might live out seven years, but not more than seven.

England, sad and shameful as it may be, had her share in those slaves. In the century just before the American Declaration of Independence, three million African slaves were carried in her ships to the New World, and two hundred fifty thousand thrown into the Atlantic after dying on the way. All the negroes in the New World, and they number many millions now, are descended from slaves stolen with cruelty and violence from the Dark Continent.

Slaves, ivory, gold, diamonds came out of Africa, yet nothing was known of the interior of the land, nothing of its shape, nothing of its great rivers. The first real attempt to solve one of the prime mysteries, the mystery of the source of the Nile, was made by a sort of resolute knight-errant. James Bruce was a Stirlingshire man, born in 1730, a scholar and business man in whom lived the old Viking strength and courage without the Viking cruelty. His name is forever associated with Abyssinia.

The Abyssinians believe their kings to be descended from Solomon and the Queen of Sheba. They practiced the Jewish religion, and afterward adopted a vague and debased form of Christianity. Yet, when this giant Scot went among them, marching on and on to reach the head waters of the Nile, they behaved with treachery and cruelty toward him.

HOW BRUCE IN ABYSSINIA WON HIS WAY WITH THE PEOPLE

But Bruce had a way with him; with his immense courage he had skill and tact. There was help for him in the royal palace, where he cured a royal princess of serious illness and earned her love. Then, as he passed on, he preserved his life by what, to the Abyssinian mind, was wonder-working. He did feats with unbroken horses such as they had never seen, so they gave him a noble horse to drive in front of him; and it proved as sure a passport as was the golden plate which Kublai Khan gave Marco Polo to help him back to Europe.

The Abyssinians had never seen a gun. Bruce brought down birds and animals with his, and they thought him inspired. They saw him shoot a candle through a stout wooden table with it, and then they were sure he must be a magician. Little by little Bruce gained his object; he reached the source of what he thought was the Nile, but it was only the Blue Nile, the largest of the Nile's tributaries.

His journey was beset with great difficulties and terrible hardships, but in four years he was in and out again, and he returned to Scotland to write a book of the marvels he had seen. It was strongly condemned as romantically but entirely dishonest. He went to his grave disbelieved. Later discoveries have fully confirmed all this strange hero wrote.

THE ADVENTURES OF MUNGO PARK, WHO FOUND THE GREAT NIGER RIVER

But if the public made mock of the gallant traveler, here and there brave hearts kindled from his fire. Mungo Park, born in Scotland in the year that Bruce was struggling up-country in Abyssinia, grew up a surgeon. Thanks to

Captain Cook's friend, Sir Joseph Banks, he gained experience of strange ways and peoples in far Sumatra, took service with an English organization called the African Association on the Gambia, learned the native language, and set out to explore the mysterious river Niger.

A savage chief, jealous, like some modern white nations, of a foreigner, imprisoned Park; but he escaped and found the Niger, the great river whose existence had been rumored but not confirmed, since ancient days. There it was, winding, not westward, as tradition said, but to the east. He was not allowed to cross it. "Have you no rivers in your own country, and is not one river like another?" asked a savage ruler.

ALL THAT WERE LEFT OF FORTY-FIVE GALLANT EXPLORERS

Following the river as far toward its source as he might, Park wandered ragged, solitary, footsore and ill, but kept all his notes like hoarded diamonds, even when he fell, too weak to walk, and was found by a slave-trader, and carried, almost dying, back to the coast.

He returned to Scotland, married and settled down, but the call of the East came again and would not be denied. He returned to explore farther. He got to within 200 miles of that dream of ages, far-famed Timbuctoo, to which the wares of every manufacturing town in England went, but where white men had never been. Disaster dogged his steps. Of forty-five companions only seven lived to reach the Niger with him.

From Sansanding he sent back the record of his travels. They reached England, but he never did. His final note in his last dispatch valiantly declared, "I set sail to the East with the fixed resolution to discover the termination of the Niger or perish in the attempt." He perished in the attempt.

THE PATHETIC STRUGGLES AND GLORIOUS FAILURES OF THE EARLY DAYS

When through manifold hardships he had reached Bussa, a fatal thing happened. Natives on the spot remembered an Englishman who some time before had accompanied a slave-hunting expedition as a sightseer. They coupled the presence of this new white man with that hated memory, and, as he and his four companions were canoeing down a dangerous series of rapids, they attacked them. Whether Park was killed or drowned we do not know, but his splendid life was sacrificed at those fatal falls.

All these early chapters of African exploration are a combination of agonized effort and glorious failure. Timbuctoo and the Niger were names that lured men like magic. Little by little the veil was raised by travelers working south from Tripoli. Ritchie, Lyons, Oundle, Denham, Clapperton and Lander carried the torch of investigation farther and farther inland, at the heaviest cost a man can pay.

Hugh Clapperton was a great spirit, a Scotchman born in the year 1788, who, rising from lowly birth to rank in the navy, went on two great African journeys to the south, and finally reached Lake Chad. He found a city of sixty thousand people dealing in English goods and reading classical literature in Arabic translations. He gained the great city of Sokoto, wonderful to us even in our own times; but he died there in 1827, as his comrades had died before him.

Clapperton had a wonderful servant in the person of Richard Lander, born in Cornwall in 1805. He was but twenty when his master passed away at Sokoto; but he bore his dead chief's notes back to England, and was himself appointed to carry on the work. He took with him his younger brother John. These two youngsters renewed the deadly task and traced the Niger to its mouth, proving that it emerges in the Bight of Benin. Yet a third journey the elder Lander made, but this was one too many. He was murdered by natives in 1834.

LITTLE BY LITTLE THE DARK CONTINENT YIELDED UP ITS SECRETS

Little by little Africa was yielding up secrets, some from the north, some from the south, some from each coast. The conquest of Algeria by the French in 1830, and the still earlier passing of Dutch possessions in the south into British hands, made these places safer, as starting-points for explorers; and systematic missionary work began among the native peoples.

We must remember that white people and the brown races who invaded the north from Asia are but a minority. The black natives long ago numbered scores of millions, and their only experience of white men was that they traded unfairly in native goods, and brutally in human lives. Their first great British missionary to preach a different story was Robert Moffat, who went to Africa in 1816.

Moffat was not an explorer, except of the human heart, but he went crusading into the dreaded wilderness and blazed a trail for searchers of territory. As he wandered up-country from Capetown, he stopped one night at the farm of an old slave-owning Boer. Asked to conduct a service, he expressed his willingness, but inquired, "Where are your Hottentots? Are they not to come in?"

"Umph," said the old man fiercely. "If it is a congregation of that sort you want, I'll call in the baboons from the mountains or the dogs from the porch."

Moffat began his service without another word, but he took for his reading the Bible story in which occur the words, "Truth, Lord, but even the dogs eat the crumbs that fall from the master's table."

The tough old Boer interrupted him, "Will you sit down a minute, you shall have the Hottentots."

And in they came, wondering. They were seeing the inside of a Christian house for the first time in their lives. When the service was over and the blacks had gone, the farmer said in his rough, kind way, "My friend, you took a hard hammer and you have broken a hard head."

THE POOR BOY IN A FACTORY WHO HEARD OF RICHARD MOFFAT

Moffat went up to the wilds of Great Namaqualand, settled at Kuruman in Bechuanaland, and transformed that wild and bloodstained land into a sanctuary of Christian light and civilization. News of his triumphs reached England and stimulated many lofty minds. One of his unknown disciples was a poor boy working in a cotton factory in Scotland, whose name was David Livingstone.

No one ever had a harder struggle to gain knowledge than Livingstone. He worked early and late, studying his book even when at his labor in the mill. His heart was wholly given to the thought of winning human souls for God. He longed to do for the people Marco Polo had visited what Moffat was doing for the blacks in Africa; but when he was qualified for mission work, war broke out in China, so he was headed off to Moffat's own region. He entered Africa as doctor, missionary and explorer in 1841, when he was twenty-eight years of age.

A YOUNG MAN'S COURAGE IN THE HEART OF AN APPALLING LAND

With his arrival, exploration entered upon a new phase, a bold departure from south to north. He married a delightful girl, Mary Moffat, daughter of his chief; and their married life is a chapter of pathetic romance to be studied for its genuine human interest.

After several years of exciting work in purely missionary effort, Livingstone, repulsed by the Boers in his efforts to found mission stations in the Transvaal, wandered north of Moffat's home, discovered Lake Ngami, and resolved to cross the continent from east to west and from west to east, between the Atlantic and Indian Oceans.

It was a tremendous resolution for a young man suddenly to take, in the heart of an appalling land, where all was dark forest gloom and mystery, where every tribe was savage, where animals menaced his life day and night, and fever, pestilence and starvation stalked side by side with him continually. But he did it. In four years he crawled and tore his way from side to side of the Dark Continent, the first white man in the world to do so.

His power over the natives was extraordinary. He went in safety where an army would have been slaughtered. He discovered facts which no one had ever guessed. By that single journey he made known one of the greatest natural wonders of the world, the mighty Victoria Falls on the Zambesi, which some day will furnish far more power than Niagara does in America.

THE AIM AND END OF ALL THE TRAVELS OF LIVINGSTONE

He came back to England, rested a while, then went back to his work of discovering and civilizing. Wherever he turned he saw the blight of the slave trade saddening the land, and he longed to master the details of the country so that he might have information for British settlers. He wished to help them find the best places in which to settle, set up honest commerce and so kill the hideous traffic in human beings.

That was the aim and end of all his travels. Those travels are not to be set down in the course of a few lines. He suffered the agony of separation from his beloved wife, when death took her in 1862; he endured repeated illnesses from the mischiefs for which a tropical climate is peculiar. But for five years he did magnificent work in discovering Lakes Shirwa and Nyasa and exploring the Zambesi, Shiré and Rovuma; and he actually, with his own hands, navigated a little steamer to Bombay in the track which Da Gama had followed long before.

Returning in 1864 for another rest in England, he was sent back to Africa for the last time in 1865. Reaching Zanzibar in January, 1866, he set out for the interior in the following April. The journey was long and difficult, and he was prostrated by illness and hampered in various ways, especially by Arab slave-traders. But after two dangerous years of exploration, he discovered Lakes Mweru and Bangweulu, and launched out into the mystery of mysteries, to learn the true story of the Congo basin, which up to that time had remained a blank on the map. He found the river flowing in gigantic volume to the north, and thought he had the Nile before him. In this, however, he was mistaken. It was the Congo, but he never knew it. More and more, illness and shortage of food and medicines weakened his wasted frame. At last he could go no farther. Famishing and fever-stricken, he stayed at Ujiji until he was found there by Henry Stanley, who had been sent in search of him with food and clothes.

The STORY OF AFRICA
This map shows the great continent of Africa and helps us to understand a wonderful thing about it. At the top corner on the right hand we see Egypt, with its pyramids and temples, and there, thousands of years ago, people lived in great cities on the banks of the River Nile. Beyond them stretches the great desert that no man could cross, and the great people of Egypt knew nothing at all of the vast country beyond. All this other part, where the trees are in this map, was wild country, and we read in this story how men have explored it and made it known.

As soon as his health was better, Livingstone went on once more with his work, and never ceased until his last illness came upon him. Then he had to rest at Ilala. He was very ill. "Build me a hut to die in," Livingstone said to his men. "I am very cold; put more grass on the hut." They built him a hut and left him, and in the morning found him kneeling beside his bed, dead. The great traveler had been called home to God while he knelt in prayer.

HOW THEY BROUGHT HOME THE BODY OF DAVID LIVINGSTONE

His loving servants knew that his friends would wish to have him buried in England, so they set out to carry his body all the way to Zanzibar, hundreds of miles away. The savages through whose country they had to pass were afraid of the missionary, now that he was dead, and thought that if the body passed that way it would bring evil upon them. So Livingstone's followers made up another package and pretended that the body was in it. This they took back and buried. But the real body they had in a bundle, as if it were merely a parcel of goods, and so got it safely to Zanzibar. From there it was carried to England, and buried in Westminster Abbey, in April, 1874.

It was when his friends in England had been very anxious about him, not having heard of him for a long time, that another explorer had been sent out to find the missionary. This man, as you already know, was Henry Morton Stanley. In his boyhood Stanley was so poor that he had to go to the workhouse school in the little village in Wales where he was born. His real name was Rowlands, but he went to America when a youth and took the name of Stanley from an American who was a good friend to him. He traveled a great deal. Noticing that his work was always well done, James Gordon Bennett, owner of The New York Herald, told him to take all the money he needed and go to Africa to find Livingstone.

THE WORKHOUSE BOY WHO WENT OUT TO FIND THE LOST EXPLORER

Stanley did so. He sailed to Zanzibar in January, 1871, marshaled an expedition with abundant supplies, and nine months later came up with the dying man at Ujiji, as we have seen. It was a meeting which will never be forgotten as long as travel records are read. In his joy Stanley could have wept aloud; he could have seized this poor, stricken hero in his arms and have embraced him; but speech faltered on his lips, and he could only bare his head and haltingly murmur the stiff and absurd formality: "Dr. Livingstone, I presume?"

Even poor agonized Livingstone could not keep back a smile at this shy hero's absurdity. However, all is well that ends well. The two were at once great friends. Livingstone was fed and brought back to health, and went on a great journey with Stanley round the north end of Lake Tanganyika, which they proved to have no connection with the Nile. Then Livingstone wandered away, while the younger man returned to civilization and fame.

A second time Stanley went to Africa, and, after important discoveries in the East, he marched round Tanganyika, and by a brave journey, carried out amid appalling difficulties and dangers, followed the Congo to where it pours its mighty waters into the Atlantic. He had still further work to do in Africa, for he was sent out in 1886 to rescue Emin Pasha. In this he succeeded, but at the cost of a disaster to a great part of his expedition, in which many men perished.

THE STRANGE MAN WHO WAS SHUT OFF FROM ALL THE WORLD

Emin was originally Edward Schnitzer, a Jew of Silesia, born in 1840. A doctor by profession, he adopted Turkish manners and religion, went to Egypt and was appointed to high office. General Gordon made him Governor of the Equatorial Province of Africa, and for eleven years this strange and able man remained, a white scholar among black savages, remote from the world, studying languages and customs, geography, meteorology, zoölogy and botany, where a white man had never lived before. He gave all his knowledge freely to the world, and was esteemed by all but the slave-traders, who found in him a remorseless opponent.

For all those years Emin remained isolated, and at last was completely hemmed in by enemies; that was why Stanley was sent to relieve him. But Emin's heart was in Africa. He returned to his old sphere and was murdered by slave raiders in 1892.

Many other names come into the great story of Africa. We must note two giants of travel in Sir Richard Francis Burton and John Hanning Speke, born adventurers of the best type. Both had had experiences enough to fill many books before the Royal Geographical Society, in 1856, sent them out to settle the source of the Nile. Two years of battling with every imaginable difficulty led up to their discovery of Lake Tanganyika.

THE PROBLEM THAT HAD PUZZLED ALL MANKIND

They parted for a time on the way home, and Speke, when alone, came upon Lake Victoria Nyanza. Ill-feeling resulted between the two explorers over this turn of fortune; so in 1860 Speke went out again in company with James Augustus Grant, further explored the Victoria Nyanza, and proved it to be a source of the Nile.

A problem which had puzzled all mankind from the time of the Pharaohs was thus settled, but a surprise was to come. Sir Samuel Baker, another Titan of travel, who had roamed the world for twenty years before marrying an accomplished and valiant Hungarian lady, set out with her to probe still deeper into the secrets of Africa. They landed as Grant and Speke were returning, and met them to hear the glad tidings that the source of the Nile had been found at last. There was still something to be done; so on went Baker and his lady into the gloomy wilds.

They heard from natives that in addition to the discoveries of Burton, Speke and Grant there remained to be found yet another inland sea. Baker and his heroic wife were not to be contented till they found it. Find it they did—the Albert Nyanza, as Sir Samuel named it. And here was the joyful surprise: Albert Nyanza is a second reservoir of the Nile.

THE DISCOVERY OF THE SOURCES OF EGYPT'S GREAT RIVER

Bruce had toiled right through Abyssinia, only to find a tributary. Expedition after expedition had laid down its life in the hopeless quest of the springs of the river which gives life and prosperity to the land of the Pharaohs, of Cleopatra and of the old scholars of Alexandria. And now, three men and a woman had in five years found the twin sources of the wonderful river. Now, little children were placed in possession of knowledge which even wise and powerful Moses had lacked. They were to see a riddle solved which had been too great for Joseph when he translated the dreams of Pharaoh.

Later, Sir Samuel Baker, still accompanied by his devoted wife, did what Livingstone described as a more noble work than the discovery of the Nile sources—he struck the first successful blow for the suppression of the slave trade in the Sudan, in spite of treacherous evasion by Egyptian officials who were pretending to help him.

The exploration of Africa brings into history a host of worthy names, but we are looking here only at the men who opened its gates, who first crossed the continent, who solved the great mystery of its rivers and great lakes. They were all heroes. They all confronted dangers and horrors unknown in the lands from which they sprang. They faced lions and leopards, hippos and rhinos, lurking jackals and bone-smashing hyenas. They challenged fevers and sicknesses whose seeds even now we are seeking like blind men in unfamiliar surroundings.

THE MYSTERY COUNTRY OF THE EARTH HAS OPENED UP AT LAST

The insects which these pioneers scorned, and died for scorning, were worse than the ravening lions. Among them the tsetse-fly is one of the most deadly. A small insect, little larger than our common house-fly, it sucks the blood of human beings and of certain animals, with usually fatal results; for few are they who recover from the diseases left in the system by these pestiferous winged creatures. A modern poet, studying a great captive lion, has unconsciously written the epitaph of hundreds of men who went out to Africa without hope of profit or renown, simply to extend the bounds of human knowledge.

How came the lion into captivity? our poet asks. A man captured it. And where is that man?

It was that man who went again, alone,
  Into thy forest dark—Lord, he was brave!
That man a fly has killed, whose bones are left
  Unburied till an earthquake digs his grave.

That is true of many of the men whose names and deeds march sadly triumphant through the memory of one who ponders the story of the explorers of Africa. The ancients, who never thought of having preventive medicines against malarial insects, were perhaps wiser than they knew in keeping out of Africa's gloomy heart. They left it for modern men to open up the last mystery land of the earth, and it has been done; but we do not know all yet.

For thousands of years men dwelt in wealth and luxury on the front doorstep of the African continent. We have gone in and possessed it, and those who paid the price would say that the conquest justified the sacrifice men have made.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 589.

THE NOBLE BEDE WITH HIS SCHOOLBOYS

Bede, translator of the Bible 1,200 years ago, teaching his boys in the school at Jarrow.

When Bibles were scarce they were chained up as in this picture of a library at Hereford Cathedral.

THE GREATEST BOOK IN ENGLISH

CONTINUED FROM 306

NO book, considered as literature, has had so great an influence on the English-speaking people as the Bible.

No other book has done so much toward molding the English language. Though in origin it is not an English book at all, it is the greatest book in the English tongue, the one best known and best deserving to be known as a literary work.

Of course, because of the subjects it brings before its readers it is a supremely great book in any language, but we are not here referring to its religious teaching. It is the influence of its style on English language that concerns us for the moment.

For more than 500 years the Bible has been more popular among English-speaking people than any other book, more read, more listened to, more known than any other writing. For more than 300 years it has set the standard and been the great example of English prose, with effects on our speech that cannot be overestimated in value.

From the earliest days of Christian England there seems to have been a desire to read the Bible. Bede's eagerness in translating the Gospel of St. John on his deathbed and Alfred's unfinished translation of the Psalms are illustrations. But of course these beginnings have no bearing on the Bible as English literature, for the language used was not English as we know it but Anglo-Saxon, unreadable by us except as a strange tongue.

The first translation that counts was Wyclif's, who lived at the same time as Chaucer, and whose version, not from the original tongues, but from the Latin, though rough and ready, and never printed till quite recent times, had a lasting influence during the next 150 years. Then William Tyndale produced his beautiful version direct from the original languages, Hebrew and Greek.

Eighty years after Tyndale had paid with his life for his ambition that "every boy that driveth the plough should know the scriptures," the noble Authorized Version was produced. It was made from versions that had gone before, but chiefly from Tyndale's, and "England became the people of a book and that book the Bible."

What is it in this book that has given it such a lasting influence on our literature, an influence far more powerful than any it has had on other languages?

An important fact is that Hebrew, the language of the Old Testament, is very simple, with clear pictures readily understood and conveying their meaning in plain words that represent common objects, even when the thought is most poetical and beautiful. "The Lord is my Shepherd, I shall not want." What could be simpler, or more tender and consoling? "A thousand years in Thy sight are but as yesterday when it is past, and as a watch in the night." What could be grander and more impressive?

HOW THE ENGLISH VERSION PRESERVES THE OLD BEAUTY OF THE BIBLE

And these definite images and thoughts by comparison were changed into as simple English words at the very time when the English language was being formed. They fitted in with it so perfectly that in modern days most of the translations of the Bible into 500 languages and dialects have been made, not from Hebrew and Greek, but from the English version which preserves, with wonderful faithfulness, the simplicity and grandeur of the language first used.

That the earliest printed language widely circulated among her people should have been so plain and clear and pure as it is in the Bible has been a blessing that will never be lost. Really it is not what might have been expected. And it is not what was happening in many other directions in the building-up of our noble English prose.

It must be remembered that learning was largely restricted to the clergy in those early days. They often lived a secluded life in which Latin was their chief study and were naturally inclined in writing to parade any knowledge which most of the people did not have. And so writing in prose was likely to be learned, cumbrous, and over the heads of unlearned persons. That is what happened then, and does happen to this day.

THE BOOK OF NATURAL MUSIC AND ITS MIGHTY INFLUENCE

Any set of men with special knowledge are inclined to create a formal language for themselves that does not readily give up its meaning to plain people. It is so with philosophy, religion, the law, medicine, education and most of all with science. There is a pretense that these dignified subjects cannot be discussed in plain speech, and so a special jargon is invented for each learned set, and in no instance does the jargon become literature. This special formal language has to be shed before any piece of prose can be read with pleasure for its own sake. How fortunate it was then that, from the first, there was a book in the language of the people, plain, strong, full, with a natural music in it, and that book one with an extraordinary variety of expression, rich in interest, and exhaustless in meaning. Theology, which is the "science of religion," swiftly hid its meaning in a clumsy jargon from which it has never escaped, but the Bible is clear, simple and beautiful. And this purity in language and style, drawn from common English speech, has been influencing sincere writers ever since.

The most popular books have always been written in words like those of the Bible, and so literature is refreshed from the wells of common speech. It has been said with truth that though the Bible language was that in common or vulgar use, it is impossible to be vulgar with it, for it is everyday language refined by choiceness and dignity.

THE RAREST STORIES IN THE BOOKS OF THE WORLD

Nor is there lack of breadth and variety in the contents of the Bible. The most vigorous of minds will not be narrowed, but will be expanded by its use. Properly studied, the Bible provides a generous education from a literary point of view. It covers a wide range of history, touching all the great nations of olden days, and there is no form of human expression that it does not illustrate.

No book in existence illustrates so well the writing of history, for it is a library of books combined into one. The separate parts now brought together as one volume were written and edited by hundreds of authors working through at least a thousand years. And they used historical records and stories that had been handed down for several thousand years.

It contains examples of every form of writing and speech. There are bare lists of family names showing how ancestry was treasured in the East, when memory was the only recorder. There are the legends of national origin, like those of every other race besides the Jewish that has emerged from a wandering life into a settled civilization.

Then, early and late, there are the choicest examples of narrative—the telling of a story, simple, graphic and beautiful—that the literatures of the world afford. Whether one is following the exquisitely told story of Joseph in Egypt forgiving his brethren, or the wanderings and talks of our Lord, or the stormy life of Paul, the telling of the story is equally

AUGUSTINE PREACHING BEFORE ETHELBERT, KING OF KENT, AND HIS QUEEN BERTHA

Gregory the Great sent Augustine to preach Christianity to the Saxons, who had ruled in England for a hundred years. He set foot in England at the very spot in Kent where Hengist and Horsa, the pagan Saxons, had landed, and founded a monastery at Canterbury, where he became the first bishop. King Ethelbert was persuaded by his wife, who was a Christian, to permit Augustine and his monks to preach the Gospel. Before long he wrote to Gregory that over 10,000 people had been converted.

perfect in its simplicity and its feeling of reality.

The Books of the Kings and the Chronicles of the Kings of Judah and Israel are examples of the writing of history, and there are many other such books. Much light is shed on the customs and religious rites of the ancient peoples of Palestine and Egypt. We go with them in scythed chariots to fight their enemies, and celebrate their feasts of full moon and harvest.

We know that people think differently in politics and religion, and sometimes criticize one another in newspapers and on the platform. This is called controversy and the Bible has examples of it in the writings of the prophets—the first men in Israel to use deliberately the power of the pen in public affairs. And how earnest those ancient statesmen and preachers were, how terrible their warnings, how eloquent their outbursts of golden hope!

Of oratory there is no lack through the story of two thousand years, down to its most formal example in the pleadings for justice by Paul, the eloquent and fearless.

Poetry is scattered lavishly through the long range of books from Genesis to the Revelation, beginning with the majestic vision of the creation of all things and ending with the vision of eternal day where the Lord God giveth an uncreated light.

Not only is there the poetry of sublime imagination, but also that of song, written in wide variety of circumstances—odes of victory, tender laments, outbursts of pious adoration, and magnificent nature poems filled with the feeling of God in all that is lovely or grand.

Then, too, there is sublime drama, as in the Book of Job, and allegory in the Book of Jonah, where under the form of a story the Jews are rebuked because they would not allow any other people to come to God.

There are proverbs strong in wisdom, fables or parables to point a moral, sermons to guide or to rebuke.

And lastly, oldest of all the writings in the New Testament, there are letters in many styles—some familiar notes about everyday things, some good advice, some closely reasoned argument, some lofty expositions of the mysteries of death. What a vast field of literature is here, vast in time, in subject, in method of writing, in variety of authorship, but one in feeling to a very large extent.

A twelfth-century picture of Bede writing.

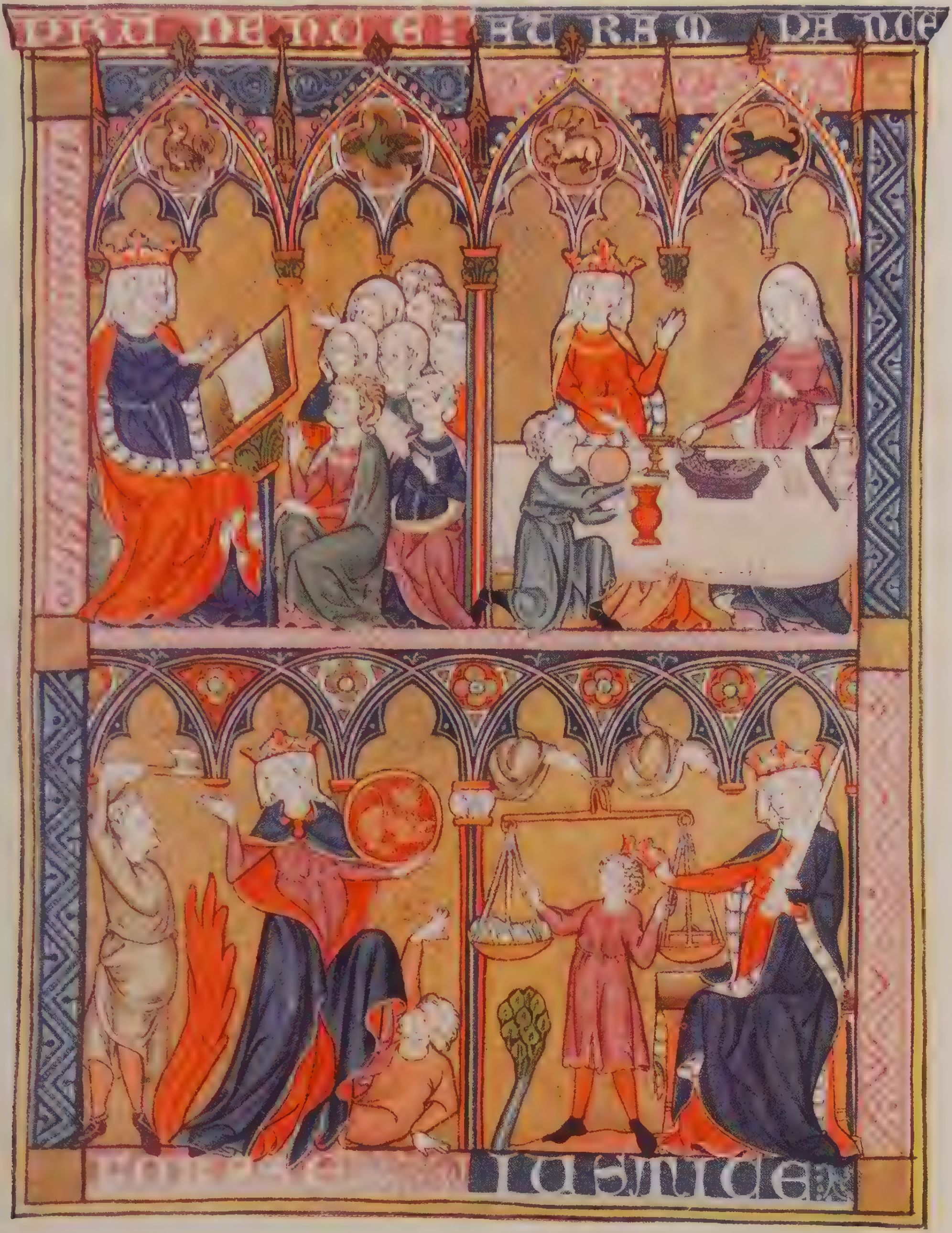
And all this—though it is the product of many minds and of other races, and though it reaches us by translation—is in effect the greatest book in the English language. The words it employs are mostly of pure English origin: its style has somewhere an appeal to every human heart. So it is that in thinking of English literature, and how prose writing came to be what it is, we are obliged to give not only an early place, but a commanding place to the Authorized Version of the Bible in English. Shaped by study and piety, it is the book which beyond all others forms the kernel of our literature, the delight alike of the scholar and of the unlearned. It finds expression for us in our most solemn moments and invites us to the noblest heights of thought.

In the world's treasure-house of literatures the share of space for the English tongue is generous; but in all that wide space the rarest gem is the translation of the Hebrew Bible and the Christian New Testament given to us by forty-seven studious men, not one of whom wrote anything remarkable on his own account.

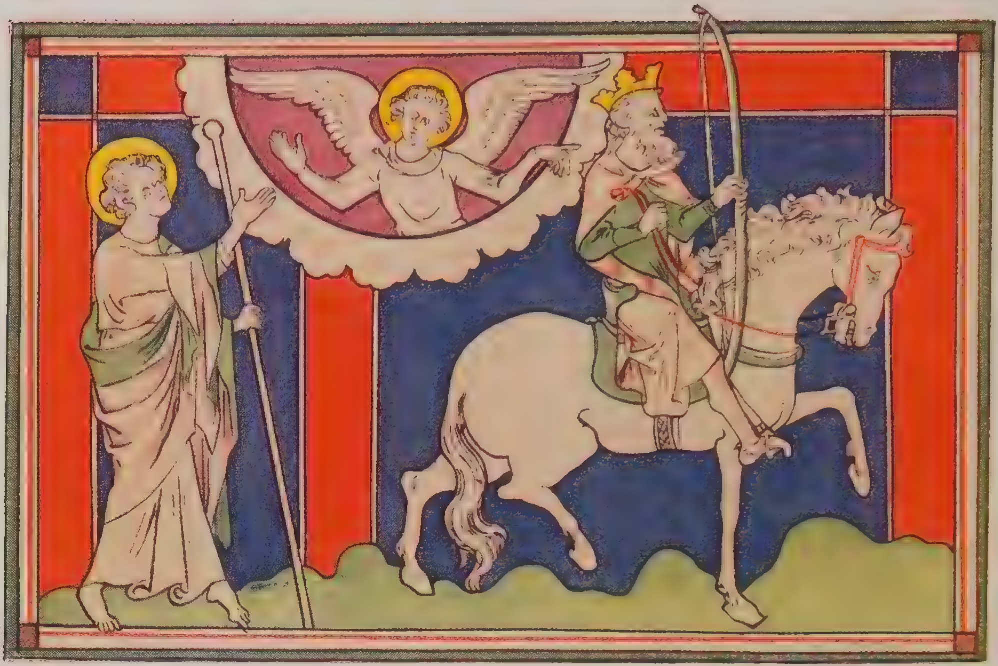
THE NEXT STORY OF LITERATURE IS ON PAGE 721

THE LOVELY BOOKS OF LONG AGO

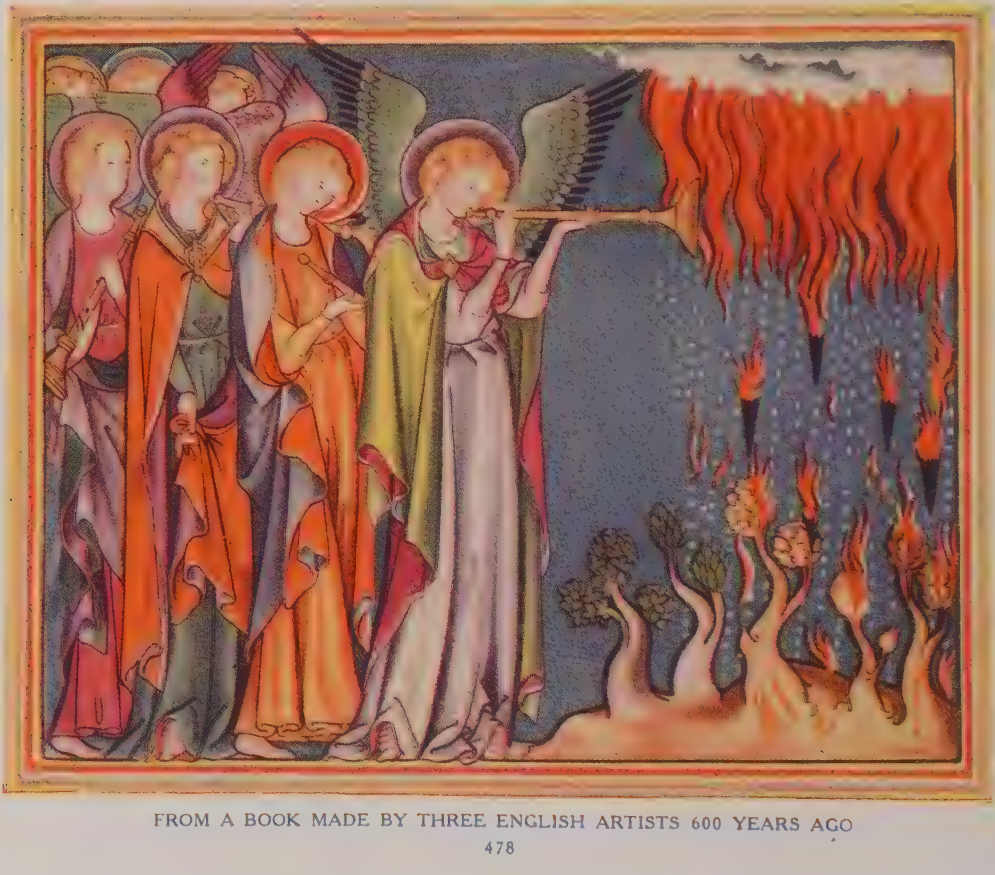
The glorious books the old monks designed and copied by hand in the days before printing make us feel how poor our books are now. Here we give a few pages from old books that have come down to us through time, and are still to be seen in the British Museum.



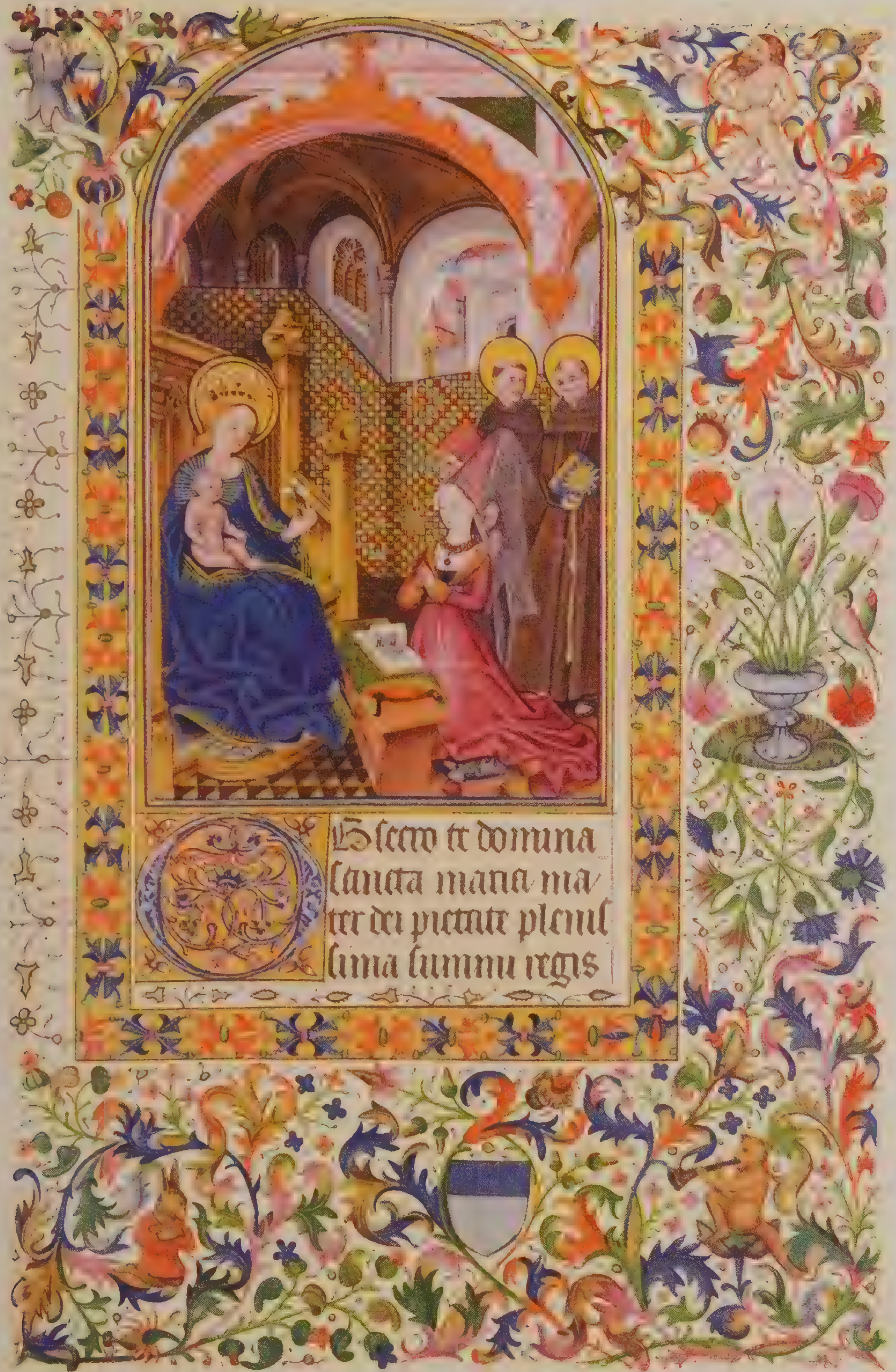
A GLORIOUS PAGE FROM A BOOK MADE BY A MONK ABOUT 600 YEARS AGO



A RIDER ON A WHITE HORSE GOES FORTH CONQUERING AND TO CONQUER



FROM A BOOK MADE BY THREE ENGLISH ARTISTS 600 YEARS AGO

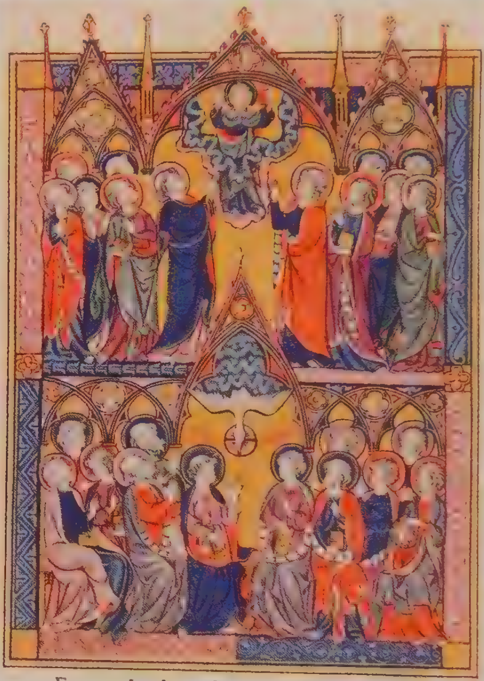


Obſecro te domina
ſancta maria ma
ter dei pietate plenıſ
ſima ſummi regis

A Page from a holy book belonging to a lady of the House of Saluces, in France, in the middle of the fifteenth century.

These pictures are from Bibles illustrated by English artists between the years 1250 and 1400.

From a book 600 years old.



From a book made about the year 1300.

Six centuries old

From a Book of Psalms made 600 years ago for an abbey of nuns.

From a Book of Psalms of about the year 1270.

15th century picture of Abraham.

Initials from an English-made Bible 650 years ago.

THE USES OF POETRY

It is a curious thing that so many people seem to think it is not worth their while to read poetry. They tell us that they "cannot" read it. That is because they have never tried seriously. But it is well worth the trying; and as we should grow up with a real love for poetry, we state here very briefly what are its chief uses. Poetry is the music of the universe; it stirs our feelings and fills our minds with beautiful pictures, so that if we do not learn to love and understand it we are missing something that adds greatly to the pleasure of life.

WHY SHOULD WE READ POETRY?

CONTINUED FROM 328

We might as well ask why birds should sing as why we should read poetry. It is natural that all people with any feeling for music should love to read poetry. When children, we are more natural in our tastes than later in life, and the taste for poetry is as natural as the liking for sweet sounds, the scent of flowers and the colors of the sunset.

We often forget that in its beginnings poetry is older than prose. When early peoples, who were very natural, wished to express joy after victory or sorrow for the fallen, they used song and not prose. One of the things that true poetry must express is feeling or emotion. When we are children we follow our feelings more than when we are grown-up, and that is partly why we like poetry so well. If, as we grow older, we continue to see the beauty of fields and woods and streams we shall always love poetry, for it is one of the best means of expressing it.

People who do not keep the love of poetry in their hearts as they grow up lose one of the truest pleasures of life.

The writers of good poetry are few, and nothing is more foolish than to think, because we can make words rhyme with others, we can write verse. But everybody is capable of reading, enjoying and profiting by good poetry. Therefore, we should not lose the taste for reading verses, which most of us have when we are young, but ought carefully to improve and strengthen that taste by reading as regularly as possible the works of the poets.

We have already said that poetry is the music of words; but it is more than that. It is the music of the universe. In the whole vast and wondrous world of created things there is a harmony of beauty that is felt by the true poet, and by him conveyed to the ordinary man.

A poet once said of great poets that they had "mountain minds," and their heads were sunned before the rest of men. If we saw a range of mountains in the early morning, as the sun was rising, we should see the taller peaks shining first in the sunlight. So it is with the great poets. Hence, when the great poets write their poems for us, they are enabling us to see into the heart of nature with something of their own keen insight. They lend us their eyes, so to speak. But they lend us their hearts also, for their poems express the feelings of their hearts far more warmly and clearly than these could ever be expressed in ordinary prose writing. There is no better education than to share with the greatest minds that have lived in this world of ours their feelings, their hopes and sorrows, their joys; and poetry enables us to do this in the simplest way.

Yes, blessings many times on all the sweet souls who have expressed themselves in poetry, and so may be said to live forever as the companions of our peaceful hours. They are our best friends, if we but turn to them; be it for noble words to refresh us in our hours of doubt and darkness; for fine pictures of the glories of the world to enlarge our love of its Creator; or for inspiring thoughts that urge us forward in the battle of life.

WHO CAN THIS SOMEBODY BE?

Somebody crawls into mamma's bed
Just at the break of day,
Snuggles up close and whispers loud,
"Somebody's come to stay!"
Somebody rushes thro' the house,
Never once shuts a door,
Scatters his playthings all around
Over the nurs'ry floor.

Climbs on the fence and tears his clothes—
Never a bit cares he,
Swings on the gate and makes mud pies—
Who can somebody be?
Somebody looks with roguish eyes
Up through his tangled hair,
"Somebody's me," says he, "but then
Somebody doesn't care."

THE BATTLE OF BLENHEIM

The great battle of Blenheim, a town on the river Danube, was fought on August 13, 1704, Marlborough commanding the English army allied with the Germans against the French and Bavarians. It was "a famous victory," but 37,000 lives were lost. This poem was written by Robert Southey, who was made poet laureate of England in 1813, though we cannot call him a great poet. By means of a very simple talk between an old man and a little boy and girl, who had found the skull of one of the slain soldiers a hundred years after the battle, the poet shows us what a terrible curse is war.

IT was a summer evening,
  Old Kaspar's work was done,
And he before his cottage door
  Was sitting in the sun;
And by him sported on the green
His little grandchild Wilhelmine.

She saw her brother Peterkin
  Roll something large and round,
Which he beside the rivulet
  In playing there had found.
He came to ask what he had found,
That was so large, and smooth, and round.

Old Kaspar took it from the boy,
  Who stood expectant by;
And then the old man shook his head
  And with a natural sigh—
"'Tis some poor fellow's skull," said he,
"Who fell in the great victory.

"I find them in my garden, for
  There's many here about;
And often when I go to plough
  The ploughshare turns them out;
For many thousand men," said he,
"Were slain in that great victory."

"Now tell us what 'twas all about,"
  Young Peterkin he cries,
And little Wilhelmine looks up
  With wonder-waiting eyes.
"Now tell us all about the war,
And what they fought each other for."

"It was the English," Kaspar cried,
  "Who put the French to rout;
But what they fought each other for
  I could not well make out.
But everybody said," quoth he,
"That 'twas a famous victory.

"My father lived at Blenheim then
  Yon little stream hard by;
They burn'd his dwelling to the ground
  And he was forced to fly:
So with his wife and child he fled,
Nor had he where to rest his head.

"With fire and sword the country round
  Was wasted far and wide;
And many a childing mother then
  And new-born baby died:
But things like that, you know, must be,
At every famous victory.

"They say it was a shocking sight
  After the field was won;
For many thousand bodies here
  Lay rotting in the sun:
But things like that, you know, must be,
After a famous victory.

"Great praise the Duke of Marlbro' won,
  And our good Prince Eugene."
"Why, 'twas a very wicked thing!"
  Said little Wilhelmine.
"Nay, nay, my little girl," quoth he,
"It was a famous victory!

"And everybody praised the Duke
  Who this great fight did win."
"But what good came of it at last?"
  Quoth little Peterkin.
"Why, that I cannot tell," said he,
"But 'twas a famous victory."

"'Tis some poor fellow's skull," said he, "who fell in the great victory."

FATHER WILLIAM

Robert Southey, in writing this poem, sought to illustrate the blessings of living a sober, industrious, virtuous life. He makes Youth ask of Age the way to live, and this is the only wise course. We should profit by the experience of those who have traveled the road of life before us.

"YOU are old, Father William," the young man cried,
"The few locks that are left you are gray;
You are hale, Father William, a hearty old man;
Now tell me the reason, I pray."

"In the days of my youth," Father William replied,
"I remembered that youth would fly fast;
And abused not my health and my vigour at first
That I never might need them at last."

"You are old, Father William," the young man cried,
"And pleasures with youth pass away;
And yet you lament not the days that are gone;
Now tell me the reason, I pray."

"In the days of my youth," Father William replied,
"I remembered that youth could not last;
I thought of the future, whatever I did,
That I never might grieve for the past."

"You are old, Father William," the young man cried,
"And life must be hastening away;
You are cheerful, and love to converse upon death;
Now tell me the reason, I pray."

"I am cheerful, young man," Father William replied;
"Let the cause thy attention engage:
In the days of my youth I remembered my God,
And He hath not forgotten my age!"

THE LITTLE BUSY BEE

We cannot call this good poetry, nor can it be said to be remarkable for beauty of thought. But there is a certain quaintness of expression and simple truth in the verses, which were favorites with our forefathers. The writer was Dr. Isaac Watts.

HOW doth the little busy bee
Improve each shining hour,
And gather honey all the day
From every opening flow'r!

How skillfully she builds her cell!
How neat she spreads the wax!
And labours hard to store it well
With the sweet food she makes.

In works of labour or of skill,
I would be busy too;
For Satan finds some mischief still
For idle hands to do.

In books, or work, or healthful play
Let my first years be past,
That I may give for ev'ry day,
Some good account at last.

A PSALM OF LIFE

A psalm is a song of praise or thankfulness. This noble poem, by Longfellow, is full of thanks to God for the good gifts of life. It counsels each one of us to do our best to-day, not to dream of to-morrow or to mourn for the past. "Let the dead Past bury its dead," means that we must resolutely turn our back on the past, do the duties that call us to-day, and march breast forward "with a heart for any fate."

TELL me not, in mournful numbers,
Life is but an empty dream!
For the soul is dead that slumbers,
And things are not what they seem.

Life is real! Life is earnest!
And the grave is not its goal;
"Dust thou art, to dust returnest,"
Was not spoken of the soul.

Not enjoyment, and not sorrow,
Is our destined end or way;
But to act, that each to-morrow
Finds us farther than to-day.

Art is long, and Time is fleeting,
And our hearts, though stout and brave,
Still, like muffled drums, are beating
Funeral marches to the grave.

In the world's broad field of battle,
In the bivouac of Life,
Be not like dumb, driven cattle!
Be a hero in the strife!

Trust no future, howe'er pleasant!
Let the dead Past bury its dead!
Act—act in the living Present!
Heart within, and God o'erhead!

Lives of great men all remind us
We can make our lives sublime,
And, departing, leave behind us
Footprints on the sands of time—

Footprints, that perhaps another,
Sailing o'er life's solemn main,
A forlorn and shipwrecked brother,
Seeing, shall take heart again.

Let us, then, be up and doing,
With a heart for any fate;
Still achieving, still pursuing,
Learn to labour and to wait.

THE MINSTREL BOY

Thomas Moore, the writer of this famous song, was an Irish poet. He was born in 1779 and died in 1852. He was a great favorite in his day, and published Lalla Rookh, his most famous work, two years after the battle of Waterloo. "The Land of song," mentioned in the following, means Ireland.

THE minstrel boy to the war has gone,
In the ranks of death you'll find him;
His father's sword he has girded on,
And his wild harp slung behind him.
"Land of song!" said the warrior bard,
"Though all the world betrays thee;
One sword, at least, thy rights shall guard,
One faithful harp shall praise thee!"

The minstrel fell, but the foeman's chain
Could not bring his proud soul under;
The harp he loved ne'er spoke again,
For he tore its chords asunder;
And said: "No chains shall sully thee,
Thou soul of love and bravery!
Thy songs were made for the pure and free,
They shall never sound in slavery!"

A CHILD'S EVENING PRAYER

The great poet knows the moods and minds of all ages, and can be as simple as a little child or as wise as the wisest scholar. Samuel Taylor Coleridge was a great poet, and here we see him uttering the thoughts of a little child in words which are beautiful in their simplicity.

ERE on my bed my limbs I lay,
God grant me grace my prayers to say!
O God, preserve my mother dear
In health and strength for many a year.
And O preserve my father too,
And may I pay him reverence due;
And may I my best thoughts employ
To be my parents' hope and joy!
And O preserve my brothers both
From evil doings and from sloth,
And may we always love each other,
Our friends, our father, and our mother!
And still, O Lord, to me impart
An innocent and grateful heart,
That after my last sleep I may
Awake to Thy eternal day. Amen.

THE FAIRIES

Written by William Allingham, who died in 1889, this is one of the most beautiful poems about fairies. Grown-up people used to believe in fairies, and in Ireland, not so very long ago, grown-ups would talk about fairies just as children do. Allingham, though his parents were English, was born in Ireland, and he no doubt got to know and love the "wee folk" by living in that beautiful fairy-haunted country.

UP the airy mountain,
Down the rushy glen,
We daren't go a-hunting,
For fear of little men;
Wee folk, good folk,
Trooping all together;
Green jacket, red cap,
And white owl's feather!

Down along the rocky shore
Some make their home,
They live on crispy pancakes
Of yellow tide-foam;
Some in the reeds
Of the black mountain-lake,
With frogs for their watch-dogs,
All night awake.

High on the hill-top
The old King sits;
He is now so old and gray,
He's nigh lost his wits.
With a bridge of white mist
Columbkill he crosses,
On his stately journeys
From Slievelegue to Rosses;
Or going up with music
On cold starry nights,
To sup with the Queen
Of the gay Northern Lights.

They stole little Bridget
For seven years long;
When she came down again,
Her friends were all gone.
They took her lightly back,
Between the night and morrow;
They thought that she was fast asleep,
But she was dead with sorrow.
They have kept her ever since
Deep within the lake,
On a bed of flag-leaves,
Watching till she wake.

By the craggy hill-side,
Through the mosses bare,
They have planted thorn-trees
For pleasure here and there.
Is any man so daring
As dig them up in spite,
He shall find their sharpest thorns
In his bed at night.

Up the airy mountain,
Down the rushy glen,
We daren't go a-hunting,
For fear of little men;
Wee folk, good folk,
Trooping all together;
Green jacket, red cap,
And white owl's feather!

COLUMBUS

This poem with its wonderful watchword of endurance, "Sail on! sail on!" is one of the greatest American poems. Permission to use this poem granted by Harr Wagner Publishing Company, publishers of Joaquin Miller's poetical works.

BEHIND him lay the gray Azores,
Behind the Gates of Hercules;
Before him not the ghost of shores,
Before him only shoreless seas.
The good mate said: "Now must we pray,
For lo! the very stars are gone.
Speak, Admiral, speak, what shall I say?"
"Why say, 'Sail on! sail on! and on!'"

"My men grow mutinous day by day;
My men grow ghastly wan and weak."
The stout mate thought of home; a spray
Of salt wave washed his swarthy cheek.
"What shall I say, brave Admiral, say,
If we sight naught but seas at dawn?"
"Why, you shall say at break of day,
'Sail on! sail on! sail on! and on!'"

They sailed and sailed, as winds might blow,
Until at last the blanched mate said:
"Why, now not even God would know
Should I and all my men fall dead.
These very winds forget their way,
For God from these dread seas is gone.
Now speak, brave Admiral, speak and say—"
He said: "Sail on! sail on! and on!"

They sailed. They sailed. Then spake the mate:
"This mad sea shows his teeth to-night.
He curls his lip, he lies in wait,
With lifted teeth, as if to bite!
Brave Admiral, say but one good word:
What shall we do when hope is gone?"
The words leapt, as a leaping sword:
"Sail on! sail on! sail on! and on!"

Then, pale and worn, he kept his deck,
And peered through darkness. Ah, that night
Of all dark nights! And then a speck—
A light! A light! A light! A light!
It grew, a star-lit flag unfurled!
It grew to be Time's burst of dawn.
He gained a world! he gave that world
Its grandest lesson: "On! sail on!"

THE TWENTY-THIRD PSALM

The Psalms of David in the Bible are among the finest poetry we can read. Many of the other books in the Bible are also poetic in form, but we do not usually think of them as poems. They are not in verse. More than two hundred years ago a poet laureate named Nahum Tate rewrote them with rhyme, and his verses are still sung; but he was a poor poet. Joseph Addison was a far greater man, and the Twenty-third Psalm here given was turned into verse by him.

THE Lord my pasture shall prepare,
And feed me with a shepherd's care;
His presence shall my want supply,
And guard me with a watchful eye;
My noonday walks He shall attend,
And all my midnight hours defend.

When in the sultry glebe I faint,
Or on the thirsty mountains pant,
To fertile vales, and dewy meads,
My weary, wandering steps He leads,
Where peaceful rivers, soft and slow,
Amid the verdant landscape flow.

Though in the paths of death I tread,
With gloomy horror overspread,
My steadfast heart shall fear no ill,
For Thou, O Lord, art with me still:
Thy friendly crook shall give me aid,
And guide me through the dreadful shade.

Though in a bare and rugged way,
Through devious lonely wilds I stray,
Thy bounty shall my pains beguile;
The barren wilderness shall smile,
With sudden greens and herbage crown'd,
And streams shall murmur all around.

RULE, BRITANNIA!

This famous song, which is known wherever the British flag waves, was first sung in the year 1740, in a little play, or masque, performed before the Prince and Princess of Wales of that time. As the masque was written by two Scottish poets named James Thomson and David Mallet, the song has been claimed for both; but it is usually thought that James Thomson, who was a good poet, if not a great one, was the author. Rule, Britannia! is not the finest poetry, but it is full of pride and the spirit which has made England one of the greatest of nations.

WHEN Britain first, at Heaven's command,
Arose from out the azure main,
This was the charter of her land,
And guardian angels sung the strain:
Rule, Britannia! Britannia rule the waves!
Britons never shall be slaves.

The nations not so blest as thee,
Must in their turn to tyrants fall;
Whilst thou shalt flourish, great and free,
The dread and envy of them all.

Still more majestic shalt thou rise,
More dreadful from each foreign stroke;
As the loud blast that tears the skies
Serves but to root thy native oak.

Thee haughty tyrants ne'er shall tame;
All their attempts to bend thee down
Will but arouse thy generous flame,
And work their woe and thy renown.

To thee belongs the rural reign;
Thy cities shall with commerce shine;
All thine shall be the subject main,
And every shore it circles thine.

The Muses, still with freedom found,
Shall to thy happy coast repair;
Blest Isle, with matchless beauty crown'd,
And manly hearts to guard the fair.
Rule, Britannia! Britannia rule the waves!
Britons never shall be slaves.

A CHILD'S THOUGHT OF GOD

Elizabeth Barrett Browning, the author of these beautiful verses, was a great poet and the wife of Robert Browning, another poet. Her pure and simple mind enabled her to see things with the clearness of a child's faith, and her power of words to express herself in noble poetry. Here she gives a wonderful idea of God's constant care and watchfulness over those of us who seek to do His will.

THEY say that God lives very high!
But if you look above the pines
You cannot see our God. And why?

And if you dig down in the mines
You never see Him in the gold,
Though from Him all that's glory shines.

God is so good, He wears a fold
Of heaven and earth across His face—
Like secrets kept, for love untold.

But still I feel that His embrace
Slides down by thrills, through all things made,
Through sight and sound of every place:

As if my tender mother laid
On my shut lids her kisses' pressure,
Half waking me at night and said:
"Who kissed you through the dark, dear guesser?"

BABY

George Macdonald, who wrote this little poem about the wonder of baby's first appearance, was a famous writer of stories, but loved best of all to make poems about childhood, and we shall have to take other flowers from him on our way through the garden of English poetry. It is printed by permission of the publishers, Messrs. Chatto & Windus.

WHERE did you come from, baby dear?
Out of the Everywhere into here.

Where did you get those eyes so blue?
Out of the sky as I came through.

What makes the light in them sparkle and spin?
Some of the starry twinkles left in.

Where did you get that little tear?
I found it waiting when I got here.

What makes your forehead so smooth and high?
A soft hand stroked it as I went by.

What makes your cheek like a warm white rose?
I saw something better than any one knows.

Whence that three-cornered smile of bliss?
Three angels gave me at once a kiss.

Where did you get this pearly ear?
God spoke, and it came out to hear.

Where did you get those arms and hands?
Love made itself into bonds and bands.

Feet, whence did you come, you darling things?
From the same box as the cherub's wings.

How did they all just come to be you?
God thought about me, and so I grew.

But how did you come to us, you dear?
God thought about you, and so I am here.

KING COPHETUA AND THE BEGGAR MAID

This is the story of an African king who for a long time cared for no one and then fell violently in love with a beggar maid named Penelophon, whom he married. We find the old ballad in the Reliques of Ancient English Poetry, an eighteenth-century collection of the "remains of our ancient English Bards and Minstrels," made by Thomas Percy, Bishop of Dromore. Tennyson wrote a very short poem about the beggar maid (you can find it upon page 736), and Shakespeare makes several allusions to the story in his plays. The romance has served many artists as a theme for their pictures.

I READ that once in Affrica
  A princely wight did raine,
Who had to name Cophetua,
  As poets they did faine.
From natures lawes he did decline,
For sure he was not of my minde,
He cared not for women-kind,
  But did them all disdaine.
But marke what hapned on a day;
As he out of his window lay,
He saw a beggar all in gray,
  The which did cause his paine.

The blinded boy that shootes so trim
  From heaven downe did hie,
He drew a dart and shot at him,
  In place where he did lye:
Which soone did pierse him to the quicke,
And when he felt the arrow pricke,
Which in his tender heart did sticke,
  He looketh as he would dye.
"What sudden chance is this," quoth he,
"That I to love must subject be,
Which never thereto would agree,
  But still did it defie?"

Then from the window he did come,
  And laid him on his bed;
A thousand heapes of care did runne
  Within his troubled head.
For now he meanes to crave her love,
And now he seekes which way to proove
How he his fancie might remoove,
  And not this beggar wed.
But Cupid had him so in snare,
That this poor begger must prepare
A salve to cure him of his care,
  Or els he would be dead.

And as he musing thus did lye,
  He thought for to devise
How he might have her companye,
  That so did 'maze his eyes.
"In thee," quoth he, "doth rest my life;
For surely thou shalt be my wife,
Or else this hand with bloody knife,
  The Gods shall sure suffice."
Then from his bed he soon arose,
And to his pallace gate he goes;
Full little then this begger knowes
  When she the king espies.

"The gods preserve your majesty,"
  The beggers all gan cry;
"Vouchsafe to give your charity,
  Our childrens food to buy."
The king to them his purse did cast,
And they to part it made great haste;
This silly woman was the last
  That after them did hye.
The king he cal'd her back againe,
And unto her he gave his chaine;
And said, "With us you shal remaine
  Till such time as we dye.

"For thou," quoth he, "shalt be my wife,
  And honoured for my queene;
With thee I meane to lead my life,
  As shortly shall be seene:
Our wedding shall appointed be,
And every thing in its degree;
Come on," quoth he, "and follow me,
  Thou shalt go shift thee cleane.
What is thy name, faire maid?" quoth he.
"Penelophon, O King," quoth she;
With that she made a lowe courtsèy;
  A trim one as I weene.

Thus hand in hand along they walke
  Unto the king's pallàce:
The king with courteous, comly talke
  This begger doth embrace.
The begger blusheth scarlet red,
And straight againe as pale as lead,
But not a word at all she said,
  She was in such amaze.
At last she spake with trembling voyce,
And said, "O King, I doe rejoyce
That you wil take me for your choyce,
  And my degree so base."

And when the wedding day was come,
  The king commanded strait
The noblemen, both all and some,
  Upon the queene to wait.
And she behaved herself that day
As if she had never walkt the way;
She had forgot her gowne of gray,
  Which she did weare of late.
The proverbe old is come to passe,
The priest, when he begins his masse,
Forgets that ever clerke he was;
  He knowth not his estate.

Here you may read Cophetua,
  Through long time fancie-fed,
Compelled by the blinded boy
  The begger for to wed:
He that did lovers lookes disdaine,
To do the same was glad and faine,
Or else he would himselfe have slaine,
  In storie, as we read.
Disdaine no whit, O lady deere,
But pitty now thy servant heere,
Least that it hap to thee this yeare,
  As to that king it did.

And thus they led a quiet life
  During their princely raine,
And in a tombe were buried both,
  As writers sheweth plaine.
The lords they tooke it grievously,
The ladies tooke it heavily,
The commons cryed pitiously,
  Their death to them was paine.
Their fame did sound so passingly,
That it did pierce the starry sky,
And throughout all the world did flye
  To every princes realme.

THE FOOL'S PRAYER*

It was this poem that gave Edward Rowland Sill a great place in American literature. He was a journalist and an author, and a professor of English literature in California University, a man of fine achievements and high ideals, but a quiet man whose fame is in the quality of his work rather than in its quantity. There is a lesson for all in these lines: we, too, should watch our blunders.

THE royal feast was done; the king
  Sought some new sport to banish care,
And to his jester cried, "Sir Fool,
  Kneel now, and make for us a prayer!"

The jester doffed his cap and bells,
  And stood the mocking court before;
They could not see the bitter smile
  Behind the painted grin he wore.

He bowed his head and bent his knee
  Upon the monarch's silken stool;
His pleading voice arose: "O Lord,
  Be merciful to me, a fool!

"No pity, Lord, could change the heart
  From red with wrong to white as wool;
The rod must heal the sin; but, Lord,
  Be merciful to me, a fool!

"'Tis not by guilt the onward sweep
  Of truth and light, O Lord, we stay;
'Tis by our follies that so long
  We hold the Earth from heaven away.

"These clumsy feet, still in the mire,
  Go crushing blossoms without end;
These hard, well-meaning hands we thrust
  Among the heart-strings of a friend.

"The ill-timed truth we might have kept—
  Who knows how sharp it pierced and stung?
The word we had not sense to say—
  Who knows how grandly it had rung!

"Our faults no tenderness should ask—
  The chastening stripes must cleanse them all;
But for our blunders—oh, in shame
  Before the eyes of heaven we fall!

"Earth bears no balsam for mistakes;
  Men crown the knave, and scourge the tool
That did his will; but thou, O Lord,
  Be merciful to me, a fool!"

The room was hushed. In silence rose
  The king, and sought his garden cool,
And walked apart, and murmured low,
  "Be merciful to me, a fool!"

HERE A LITTLE CHILD I STAND

Here is a quaint grace before meat for a little child, written by Robert Herrick. *Paddocks* are toads. A *benison* is a blessing. Though it is odd, it is surely a very pretty grace.

HERE a little child I stand,
  Heaving up my either hand;
Cold as paddocks though they be,
Here I lift them up to Thee,
For a benison to fall
On our meat and on us all. Amen.

OPPORTUNITY*

Here is another poem by Edward Rowland Sill, whose Fool's Prayer we so enjoyed. It was a great pity he died so early in life before the great promise of his talent could bear its full fruit. His subject here is an old one, the contrast between the man who sighs for an opportunity to do great things and the man who does them by seizing whatever means already exist, and thus creates the opportunity for himself.

THIS I beheld, or dreamed it in a dream—
  There spread a cloud of dust along a plain;
And underneath the cloud, or in it, raged
A furious battle, and men yelled, and swords
Shocked with swords and shields. A prince's banner
Wavered, then staggered backward, hemmed by foes.

A craven hung along the battle's edge,
And thought, "Had I a sword of keener steel—
That blue blade that the king's son bears—but this
Blunt thing!"—he snapped and flung it from his hand,
And lowering crept away, and left the field.

Then came the king's son, wounded, sore bestead,
And weaponless, saw the broken sword,
Hilt buried in the dry and trodden sand,
And ran and snatched it, and, with battle shout
Lifted afresh, he hewed the enemy down,
And saved a great cause that heroic day.

ALLAN WATER

Most of us have heard this old ballad sung to a plaintive air. It tells its sad little story in simple touching lines. Its author, Matthew Gregory Lewis, was born in 1775 and died in 1818. This is his best-known poem.

ON the banks of Allan Water,
  When the sweet spring-time did fall,
Was the miller's lovely daughter,
    Fairest of them all.

For his bride a soldier sought her,
And a winning tongue had he,
On the banks of Allan Water,
    None so gay as she.

On the banks of Allan Water,
When brown autumn spread his store,
There I saw the miller's daughter,
    But she smiled no more.

For the summer grief had brought her,
And the soldier false was he,
On the banks of Allan Water,
    None so sad as she.

On the banks of Allan Water,
When the winter snow fell fast,
Still was seen the miller's daughter,
    Chilling blew the blast.

But the miller's lovely daughter,
Both from cold and care was free;
On the banks of Allan Water,
    There a corse lay she.

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ANNABEL LEE

Edgar Allan Poe, the author of this poem, was an American poet and prose-writer of a very high order who was born in 1809 and died in 1849. He had many friends but led a somewhat uncomfortable and struggling life because of his peculiar temperament. His prose tales and his poems make a strong appeal to the imagination.

IT was many and many a year ago,
In a kingdom by the sea,
That a maiden there lived whom you may know
By the name of Annabel Lee;
And this maiden she lived with no other thought
Than to love and be loved by me.

I was a child and she was a child,
In this kingdom by the sea,
But we loved with a love that was more than love,
I and my Annabel Lee;
With a love that the wingèd seraphs of heaven
Coveted her and me.

And this was the reason that, long ago,
In this kingdom by the sea,
A wind blew out of a cloud, chilling
My beautiful Annabel Lee;
So that her highborn kinsmen came
And bore her away from me,
To shut her up in a sepulchre
In this kingdom by the sea.

The angels, not half so happy in heaven,
Went envying her and me;
Yes! that was the reason (as all men know,
In this kingdom by the sea)
That the wind came out of the cloud by night,
Chilling and killing my Annabel Lee.

But our love it was stronger by far than the love
Of those who were older than we,
Of many far wiser than we;
And neither the angels in heaven above,
Nor the demons down under the sea,
Can ever dissever my soul from the soul
Of the beautiful Annabel Lee:

For the moon never beams, without bringing me dreams
Of the beautiful Annabel Lee;
And the stars never rise, but I feel the bright eyes
Of the beautiful Annabel Lee;
And so, all the night-tide, I lie down by the side
Of my darling—my darling—my life and my bride,
In her sepulchre there by the sea,
In her tomb by the sounding sea.

TO THE MOON

ART thou pale for weariness
Of climbing heaven, and gazing on the earth,
Wandering companionless
Among the stars that have a different birth,—
And ever-changing, like a joyless eye
That finds no object worth its constancy?

—PERCY BYSSHE SHELLEY.

GIVE A MAN A HORSE HE CAN RIDE

This vigorous little song picturing three sides of manly happiness was written by James Thomson, the poet of despair who, alas, had little of such happiness, and sank into deep gloom and disappointment. He died in 1882.

GIVE a man a horse he can ride,
Give a man a boat he can sail,
And his rank and wealth, his strength and health,
Nor sea nor shore shall fail.

Give a man a pipe he can smoke,
Give a man a book he can read,
And his home is bright with a calm delight,
Though the room be poor indeed.

Give a man a girl he can love,
As I, O my Love, love thee,
And his hand is great with the pulse of Fate
At home, on land, on sea.

TO CELIA

This exquisite little song from the pen of "rare" Ben Jonson is one of the gems which earned him his title.

DRINK to me only with thine eyes,
And I will pledge with mine;
Or leave a kiss but in the cup
And I'll not look for wine.
The thirst that from the soul doth rise
Doth ask a drink divine;
But might I of Jove's nectar sup,
I would not change for thine.

I sent thee late a rosy wreath,
Not so much honouring thee
As giving it a hope that there
It could not wither'd be;
But thou thereon didst only breathe
And sent'st it back to me;
Since when it grows, and smells, I swear,
Not of itself but thee!

THE VIOLET

The violet is a true type of modesty. Though it has much to be proud of in beauty, grace and perfume, the flower seeks a retired spot and there hangs its head. The author of these verses is Jane Thatcher.

DOWN in a green and shady bed
A modest violet grew;
Its stalk was bent, it hung its head,
As if to hide from view.

And yet it was a lovely flower,
Its colors bright and fair;
It might have graced a rosy bower,
Instead of hiding there.

Yet there it was content to bloom,
In modest tints arrayed;
And there it spreads its sweet perfume,
Within the silent shade.

Then let me to the valley go,
This pretty flower to see;
That I may also learn to grow
In sweet humility.

THE NONSENSE OF EDWARD LEAR

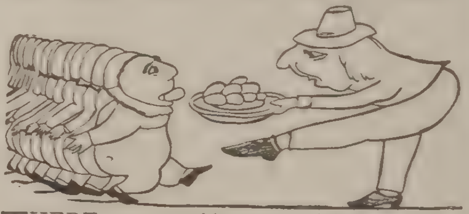
THERE was an old man in a pew,
Whose waistcoat was spotted with blue;
But he tore it in pieces,
To give to his nieces,
That cheerful old man in a pew.

THERE was a young lady of Portugal,
Whose ideas were excessively nautical;
She climbed up a tree,
To examine the sea,
But declared she would never leave Portugal.

THERE was an old man of Aôsta, [her;
Who possessed a large cow, but he lost
But they said, "Don't you see,
She has rushed up a tree?
You invidious old man of Aôsta!"

THERE was an old man with a poker,
Who painted his face with red oker;
When they said, "You're a guy!"
He made no reply,
But knocked them all down with his poker.

THERE was an old lady of Chertsey,
Who made a remarkable curtsey;
She twirled round and round,
Till she sunk underground,
Which distressed all the people of Chertsey.



THERE was an old man of Apulia,
Whose conduct was very peculiar;
He fed twenty sons
Upon nothing but buns,
That whimsical man of Apulia.

THERE was an old person of Rhodes,
Who strongly objected to toads;
He paid several cousins
To catch them by dozens,
That futile old person of Rhodes.

THERE was an old person of Basing,
Whose presence of mind was amazing;
He purchased a steed,
Which he rode at full speed,
And escaped from the people of Basing.

THERE was an old man in a boat,
Who said, "I'm afloat! I'm afloat!"
When they said, "No, you ain't!"
He was ready to faint,
That unhappy old man in the boat.

THERE was an old man of Nepaul,
From his horse had a terrible fall;
But, though split quite in two,
By some very strong glue,
They mended that man of Nepaul.

THERE was an old man with a flute,
A sarpint ran into his boot;
But he played day and night,
Till the sarpint took fright,
And avoided that man with a flute.

THERE was a young lady of Russia,
Who screamed so that no one could hush her;
Her screams were extreme,
No one heard such a scream,
As was screamed by that lady of Russia.

THERE was an old man on some rocks,
Who shut his wife up in a box;
When she said, "Let me out,"
He exclaimed, "Without doubt,
You will pass all your life in that box."

THERE was an old person of Dover,
Who rushed through a field of blue clover;
But some very large bees
Stung his nose and his knees,
So he very soon went back to Dover.

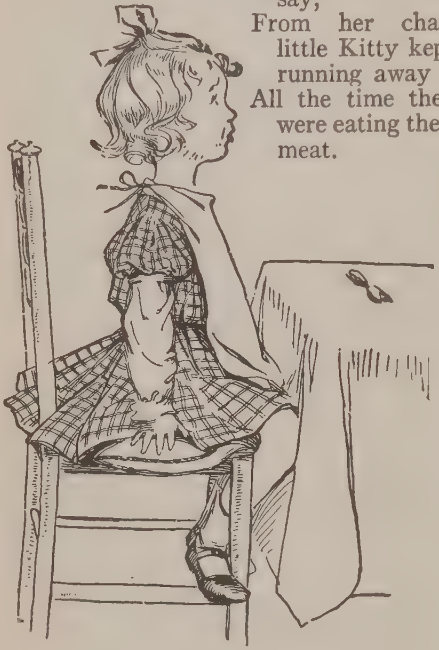
THERE was an old man at a casement,
Who held up his hands in amazement;
When they said, "Sir, you'll fall!"
He replied, "Not at all!"
That incipient old man at a casement.

THERE was an old person of Chili,
Whose conduct was painfully silly;
He sat on the stairs,
Eating apples and pears,
That imprudent old person of Chili.

LITTLE VERSES FOR VERY LITTLE PEOPLE

LITTLE Polly Flinders,
Sat among the cinders,
Warming her pretty little toes;
Her mother came and caught her,
And whipped her little daughter
For spoiling her nice new clothes.

MISS KITTY was rude at the table one day,
And would not sit still on her seat;
Regardless of all that her mother could say,
From her chair little Kitty kept running away
All the time they were eating their meat.



As soon as she saw that the beef was removed,
She ran to her chair in great haste;
But her mother such giddy behavior reproved
By sending away the sweet pudding she loved,
Without giving Kitty one taste.

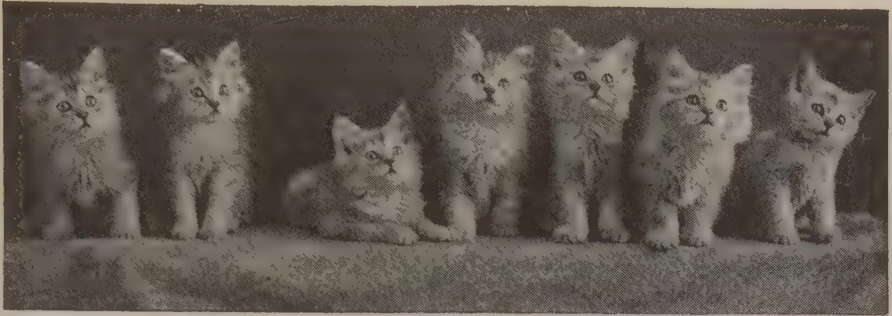
ROWLEY POWLEY, pudding and pie,
Kissed the girls and made them cry;
When the girls came out to play,
Rowley Powley ran away.

THERE was an old man in a tree,
Who was horribly bored by a bee;
When they said, "Does it buzz?"
He replied, "Yes, it does!
It's a regular brute of a bee!"

THERE was a little girl, who had a little curl,
Right in the middle of her forehead;
When she was good, she was very, very good,
But when she was bad, she was horrid.

One day she went upstairs, while her parents, unawares,
In the kitchen down below were occupied with meals;
And she stood upon her head, on her little truckle bed,
And she then began hurraying with her heels.

Her mother heard the noise, and thought it was the boys
A-playing at a combat in the attic;
But when she climbed the stair, and saw Jemima there,
She took and she did whip her most emphatic.



BIG CATS AND LITTLE CATS

CONTINUED FROM 359

IT is a disturbing and terrible thought that one of the most magnificent orders in the scale of nature lives by unceasing slaughter. For fierce and insolent beauty, for grace, strength, speed and audacity, there is no living thing to excel the animals that feed on flesh.

Long process of refining of wits, of sharpening of natural weapons, has brought these carnivores—so they are called—to the highest pitch of efficiency in the capture and killing of other animals.

Day and night the Carnivora are playing their appointed part in keeping down numbers. They themselves are without visible foes, yet have a mysterious check on over-multiplication. Generally, the flesh-eaters are more numerous at a birth than the herb-eaters. But an unseen agency takes off cubs from every nursery, or the flesh-eaters would be too numerous, and would destroy all herb-eaters.

Check and counter-check are constantly at work to maintain the balance, and as for the terrors of it all—they hardly exist! The deer and antelope tribes, the stock source of the flesh-eaters' meals, are possibly the happiest things in dumb creation. They are born with a sense of caution in the presence of lions, leopards and tigers as emphatic as their instinct to find food and water and mates.

The conditions of jungle and plain and forest are not more frightful to animals than the traffic dangers of a city corner to a resident, born to elude such perils. We must imagine that a cheery gazelle is not more worried by the possibility of an encounter with a lion than we are by the possibilities of motor buses, wasp-stings, and bites from the mad dogs we may never meet.

The Strand or Times Square would be more horrifying to a lion or an antelope than the jungle or the forest to us. Life is anxious, full of responsibilities to all. Any human being may have to cross Main Street in the high tide of traffic, or to face the viper in the wilds; yet he is happy, unafraid. The eland may reach its busy corner when a lion is near; a gazelle must avoid a wasp-sting when a hyena lurches at it. The balance is on the side of escape and happiness for the great majority, human and animal.

Freed from any challenge from animals, the cats are the necessary tyrants of the world, by right of might. Like the other carnivores, they have claws, not nails, and teeth which tear and chop or shear like scissors, but do not masticate. Lion, tiger, leopard, lynx, the domestic pet on the hearth—they are all cats, with the lion at the head of the family as the king of beasts, at home in Africa and Persia, but now almost extinct in India.

The majestic appearance of the male lion is crowned by a great mane, sometimes black, but always darker than the tawny skin. Added to that it has the most stupendous voice in nature; its ground-shaking roars unnerve animals so that they are often incapable of flight.

This is its armament: teeth which can crush at one bite the bones of a buffalo's, an eland's or a zebra's neck; claws like grapnels of yellow horn, which can hold a horse from its gallop and strip the flesh from its flanks; a gape which admits a man's head into its mouth; strength which enables it to leap a fence when hauling a dead bullock in its mouth; speed which makes it, for a short distance, a kind of flesh-and-bone thunderbolt.

Although it is called the king of beasts, it is really less formidable than the tiger, which has greater strength of jaws and claws. Yet the lion is sufficiently terrible. As a rule, it does not attack man; now and then it eats only human flesh; sometimes it takes man or beast by turns.

THE LIONS THAT CREPT OUT OF THE JUNGLE NIGHT BY NIGHT

One which entered the camp of Mr. J. G. Millais had previously eaten six native women, but on leaping into the inclosure it struck, not at men, but at a donkey, five yards from the fire. The donkey fell dead, and two others, tethered near, broke their ropes and fled. The lion bounded after them and killed first one, then the other, and lay down to eat the third.

The two most notorious lions in all African history began their public career by raiding the sheep and goats collected for the workers who were building the Uganda Railway. Then they invaded the camp of men at Tsavo, and for nine months caused a reign of terror there. Night after night they crept from the jungle into the little city of tents; night after night each carried off a man. As darkness fell the beasts would be heard roaring in the forest. Silence would follow, then a cry of anguish would ring out, "Beware, brothers; Satan is here," and all knew that another poor native had gone to make a ravening lion's supper.

The resources of the British Empire were behind the building of that railway, but the slaughter by these two lions became so terrible that at last panic paralyzed the undertaking, and all work ceased for about a month. Finally Colonel Patterson shot the two brutes, and the line again marched forward.

Conditions such as those are often brought about by tigers in the domestic life of India, where one animal may kill over a hundred people in a year as the people go at night to draw water from a well. A white man arrives and kills the tiger, but another creature of the same species sometimes appears in the old beat, and the remnants of a village population, terrorized beyond endurance, flee at last.

THE TIGERS AND LEOPARDS, AND THE TERRIBLE WORK THEY DO

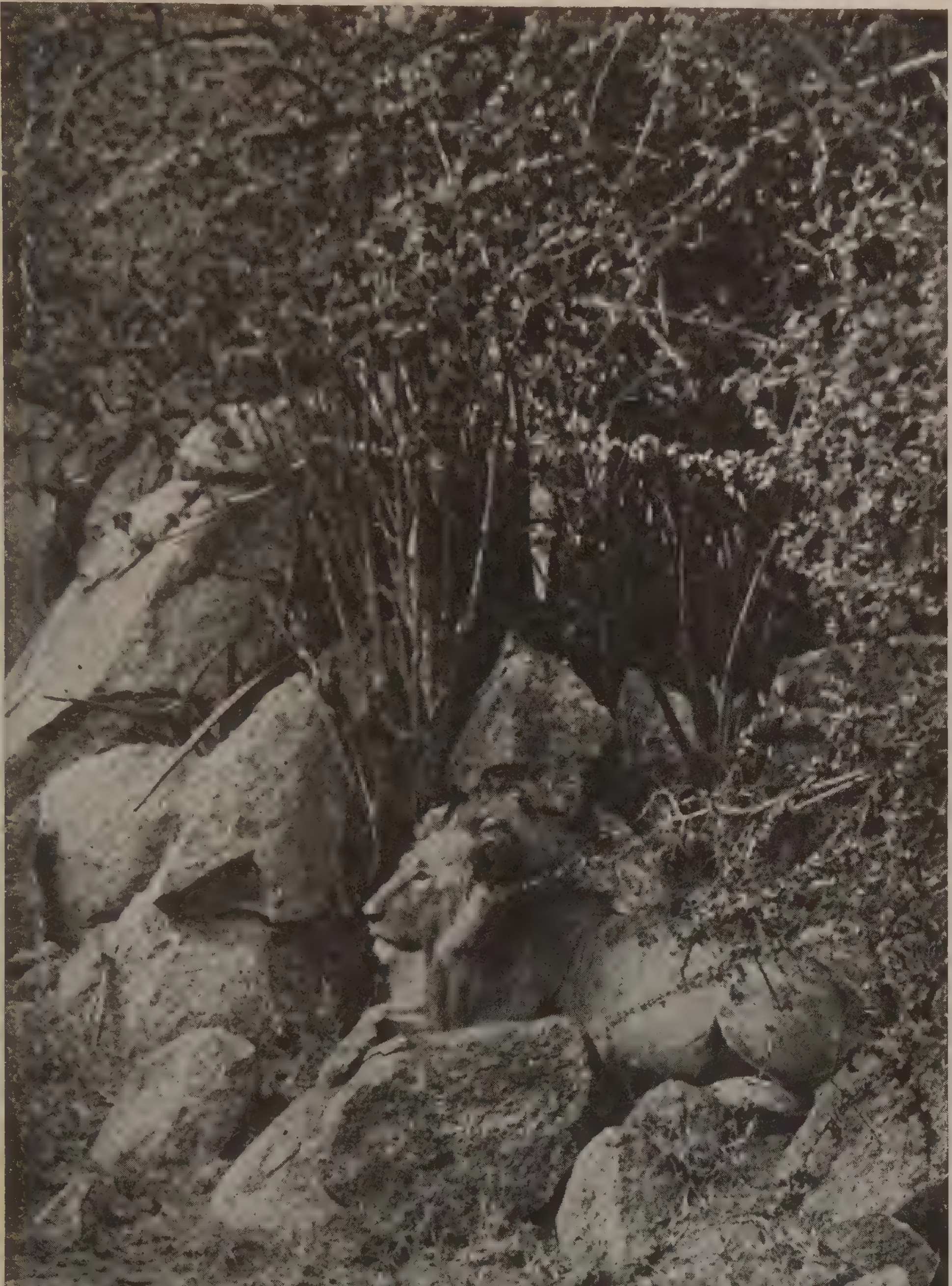
The giants of the tiger tribe live in Manchuria, monsters, huge of bone and muscle, long of fur, at home in the snow and rigors of a bitter climate; but the Indian tiger is full lion size—ten feet long and up to 550 pounds in weight. With its ability to live in swamps, in reeds, grasses, in caves of rocks, in old buildings and deserted cities, it has a wider range than the lion, and is the foremost death-dealer among Indian animals. What the casualty list from lions is in Africa no man knows, but in India tigers kill about 800 people every year, to say nothing of the thousands of domestic cattle.

Next to the tigers come the leopards, the second animal scourge of India. Some 5,000 leopards are every year disposed of there, but the animals kill on an average 350 Indians in the same time. In a sense leopards are more to be feared than lions and tigers, for, while these two cannot climb trees, leopards climb superbly, either to catch a fugitive or to lurk in hiding ready to pounce down on one. In Africa the leopard is viewed with special abhorrence for this reason. All these great cats are extremely difficult to kill. If dying animals do not feel the pain inflicted by the big cats, the big cats seem to experience none themselves.

THE LION THAT KILLED A FAMOUS STATESMAN'S BROTHER

The lion which killed the brother of Viscount Grey was first shot through the right shoulder, then through the lower jaw, then through the body, and finally through the heart. Between the second and third shots it charged home at Mr. Grey, and bit him frightfully. After the third shot it turned on him again, and with its damaged lower jaw "worried him as a dog worries a rat," as the unhappy man's friend said. The last of the four shots, all fired at close range, was fatal; but so were Mr. Grey's wounds.

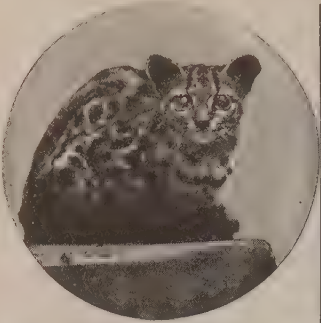
Now, in the presence of these horrors it is consoling to find that Mr. Grey was

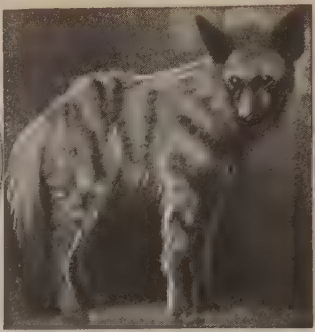


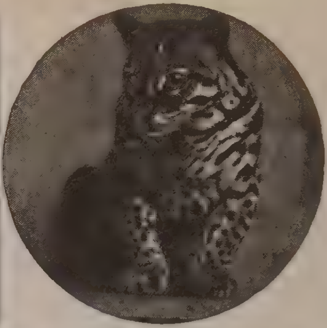
© A. J. Klein, from Wide World Photos.

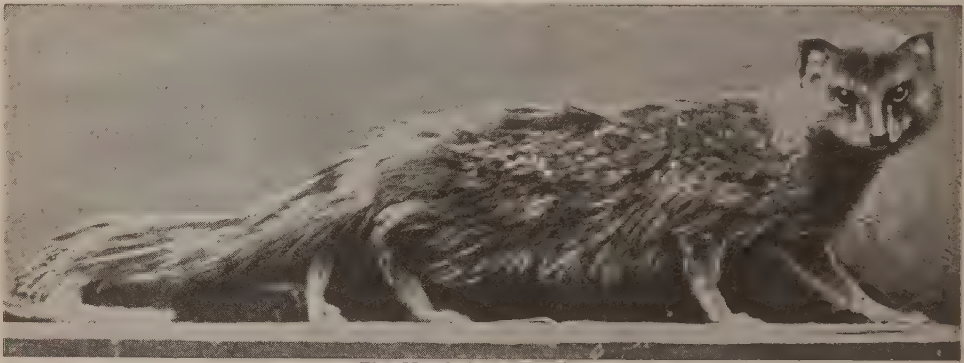
This, the most remarkable picture of a lion in repose in his native lair, was taken by A. J. Klein, who, during his fourteen years of wanderings in Africa, never had seen a similar opportunity. The tawny King of the forest is drying himself in the sun after being drenched on a rainy night spent in hunting his prey.

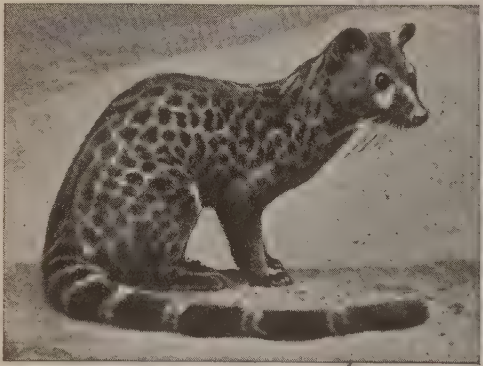
EIGHT COUSINS OF PUSSY-BY-THE-FIRE

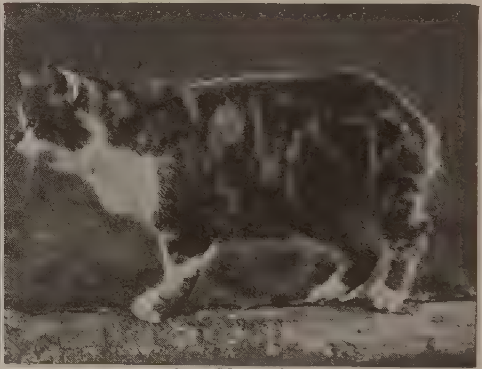

The Tigerine Cat.

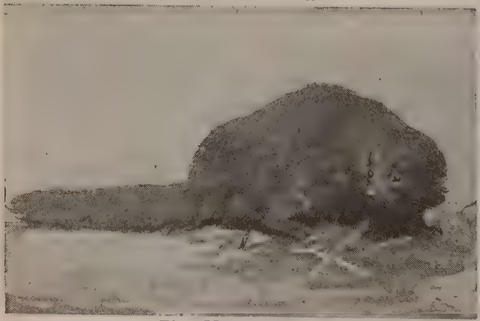

The Aard-wolf.

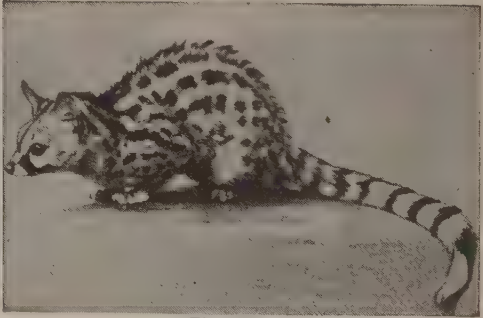

The Ocelot.


The Meerkat at attention.


Waterhouse's Genet.


The Manx Cat.


The Mongoose.


The Genet.

The photographs on these pages are by Messrs. Gambier Bolton, W. S. Berridge, C. Reid, Alfieri, and W. P. Dando.

MEMBERS OF THE GREAT CAT FAMILY

PUSSY ON THE HEARTH

THE FIERCE TIGER OF INDIA

THE MAJESTIC LION OF AFRICA

THE FINE HEAD OF THE SNOW LEOPARD

THE HANDSOME JAGUAR

FIERCE-LOOKING WILD CATS OF SCOTLAND

THE STRIPED HYENA

THE LEOPARD

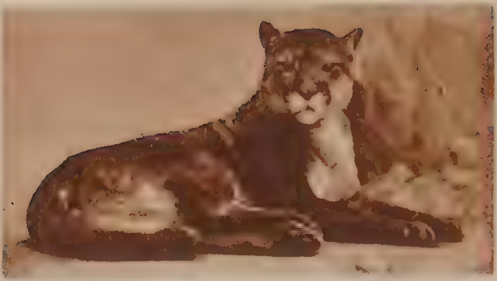
THE CLOUDED LEOPARD

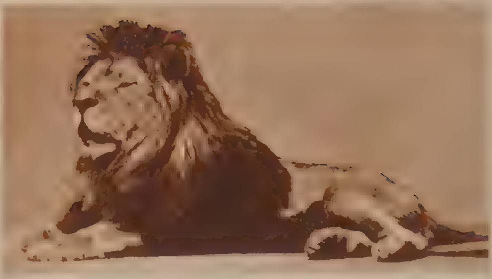
A LIONESS LOOKS OUT

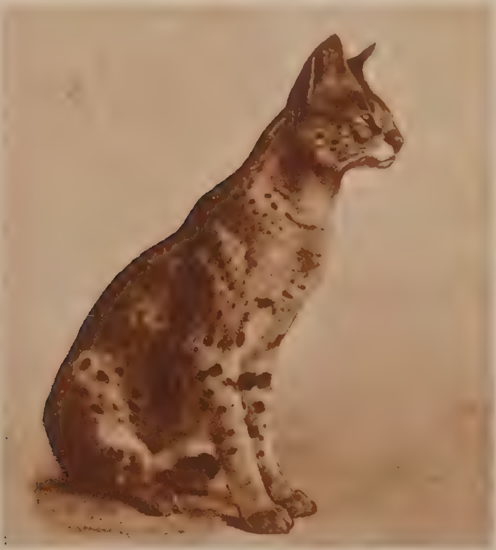
THE BEAUTIFUL SNOW LEOPARD

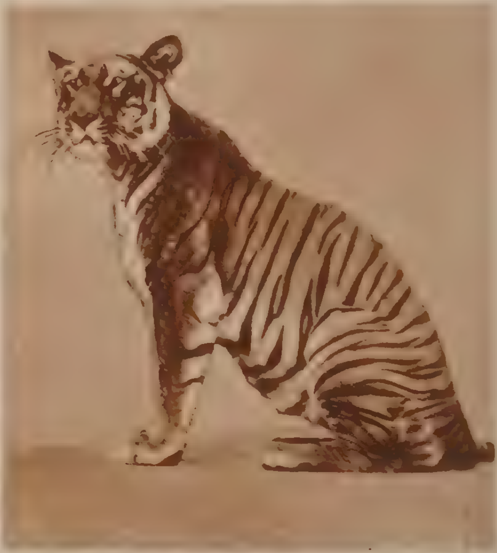
THE JAGUAR

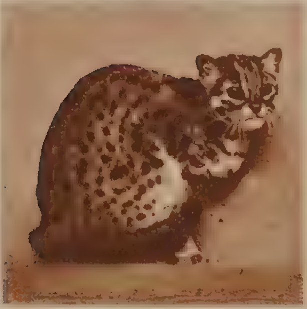
THE LYNX

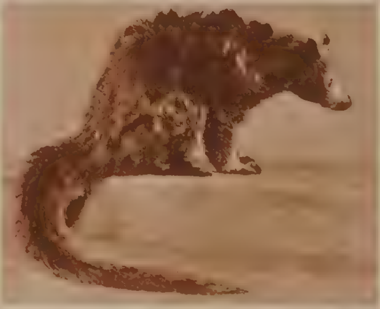

THE PUMA OF AMERICA

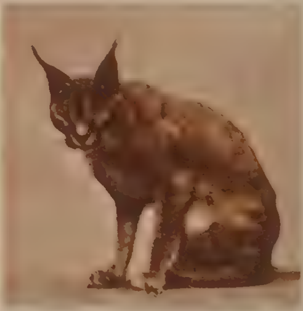

THE KING OF BEASTS

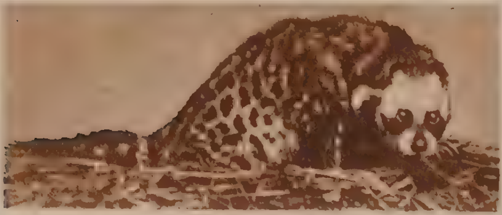

THE WEST AFRICAN SERVAL

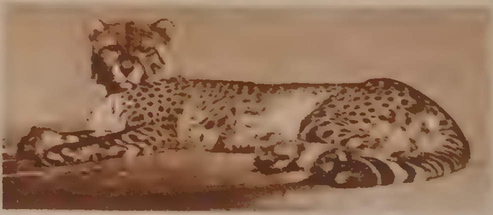

THE TIGER AT HIS EASE


THE LEOPARD CAT


THE BINTURONG


THE CARACAL


THE AFRICAN CIVET


THE CHEETAH

able to assure those about him that he felt no pain. He did not suffer at all; shock and loss of blood, not agony, caused his death. Sir Edward Bradford had his left arm munched away up to the elbow by a tiger, and sat at dinner one night with Rustem Pasha, who had lost his right hand and left arm to a bear. Both men were able to say that they had no suffering during the mutilation. They agreed that probably their intense desire to defend themselves prevented them from feeling the pain.

THE LION WHICH SHAKES A MAN AS A CAT SHAKES A MOUSE

Dr. Livingstone, who was terribly bitten by a lion in Africa, had a different and deeply significant theory. The shock, said he, produced a stupor, similar to that which seems to be felt by a mouse after the first shake by a cat. It caused a sort of dreaminess, in which there was complete consciousness of what was happening, but no sense of pain, no feeling of terror. It annihilated fear, and allowed no sense of horror in looking round at the beast. This peculiar state, Livingstone urges, is "probably produced in all animals killed by the Carnivora, and, if so, is a merciful provision by our benevolent Creator for lessening the pain of death."

There is comfort in that thought as we consider the daily lives of this splendid but pitiless order of flesh-eaters—animals which would perish within a week if other animals were not available as food.

Lion, tiger, leopard we have named, but a special type of leopard must be added—the ounce, or snow-leopard, which haunts the towering Himalayas. In summer it ranges up to 18,000 feet. It is formidable at a height where a man is so exhausted that he thinks twice before undergoing the exertion of turning over in bed. There this redoubtable great cat lives, never coming lower than 6,000 feet.

THE PUMA THAT WILL ONLY ATTACK A MAN TO SAVE ITSELF

So far we have kept to the Old World, but now we must cross to the New, where we find no lions or tigers, but interesting parallels. The American jaguar is a big leopard, with huge, powerful limbs, decorated with rosettes instead of spots like its Old World cousin; an accomplished swimmer and climber, a deadly foe to cattle and horses, and as ready to kill an unarmed man as to look at him. The jaguar slays an ox, and drags it lightly into hiding; he revels in horse flesh of his own procuring.

America's lion is the puma, which, if men were not there to dispute its path to progress, might become plentiful, and for this reason, that the more varied an animal's diet the greater that animal's chance for survival. The puma eats anything, from a pig to a porcupine, from a horse to a snail, from a sheep to a bullock. It is a terrible scourge to ranches, and in olden days exterminated the half-wild horses which roamed free in Patagonia.

The one thing in its favor is that in no circumstances will it attack man unless it has to fight him to save its own life. It ranges from Canada to Patagonia, and bears different names, as cougar, panther, mountain-lion, in different sections.

THE FASTEST SHORT-DISTANCE RUNNER IN THE WHOLE ANIMAL KINGDOM

There are dozens of other cats. There is one beast, called the clouded leopard, which is as much a tree-dweller as a sloth. The lynx of both the Old and the New Worlds and the caracal are also cats. Then we launch into a world of lesser cats; the golden cat of the Indo-Malay area, which has a gray Chinese cousin; the fishing-cat, which not only catches fish but little children and hosts of animals as well; the leopard cat, the serval, the tiger cat, the eyra, a weasel-like type; the Egyptian or Kaffir cat, from which our own puss is believed to descend; the various wild cats of America and the old wild cat of Britain, stupid and untamable up in its last retreat, the Highland deer forests, all belong to the cat family. Each one is Destiny to some order of grass-feeders.

There are others, and we must note the cheetah, more cat than dog, yet not quite cat either, a leopard-like beast with claws resembling a dog's, and therefore not capable of freely working in and out of their sheaths. This animal is remarkable as the one which is caught young and trained to hunt like a dog, its quarry being the swift deer of India. A cheetah runs down the fleetest of grass-feeders, and is regarded as the fastest of all runners for any distance up to about 400 yards.

The cheetah and the domestic cat are the only animals from the feline group that we have brought home with us from the wilds, but our puss shows what man's selective care can do. Arising from a common stock we have dozens of breeds of pet cats.

It is a wonderful choice—white, black, blue, cream, tabby, sandy, silver, brown, and all the combinations desirable from a blend of those colors. There are long-haired cats, there are short-haired cats, there is even a hairless Mexican cat. Chinchillas, tortoiseshell, Persians, Russians; Manx, without a vestige of a tail, nor even a bone of one; Abyssinian, Indian, Siamese; white cats that are deaf, white cats that are tailless—what would you have? Every sort and size, every color and disposition, is available—a triumph for scientific breeding.

Farewell, then, to lion and family, and now to their near kindred. These are found in the civets, a tribe which, beginning with the catlike fossa, has thrown up a great number of species, all in the Old World. Without dealing with anatomical niceties we may note that they are all long-bodied and short-legged.

THE PLUCKY LITTLE MONGOOSE THAT WILL FIGHT A SNAKE

The group includes the remarkable true civets, which develop a well-known perfume. Africa, India, Malay, Java, Malabar, all give their name to civets; there are civets that rob the Java coffee trees of their ripe berries, that frequent the palm trees of Africa and Asia, and civets in the East which are otter-shaped and supremely adapted to life in the water—though sleeping, of course, on land.

In the same family we come next to the mongooses, or ichneumons, as varied a group as the civets, distinguished into genera and species by color, teeth, toes, thick tails, thin tails, short tails, white tails, red tails. Those which chiefly interest us, however, are the true mongooses.

These little animals, sacred in Egypt, are natural guardians of Indian and Egyptian homes. They are great snake-fighters. Long ago there was an unspoken bargain between man and mongoose, that man should furnish the home and mongoose should fight and eat all the snakes that appeared. The mongoose has redeemed his bond. He is incorrectly believed to be unhurt by cobra-poison, but he fights with such agility as rarely to be bitten. Master mongoose is not so pretty a pet as the jolly South African meerkat, but he is a fearless little ally when snakes come. Have you read Kipling's story of Rikki-Tikki-Tavi?

From the cats to the civets, from the civets to the hyenas, with that strange animal, the aard-wolf, to act as connecting link. Built like a long-legged fox, and resembling a starveling striped hyena in appearance, this creature, living in burrows, seldom seen by day, and eating carrion and termites, seems an isolated freak; but it shows us how civets developed along one line and hyenas along another, from a far-away common ancestry.

A HIDEOUS CREATURE THAT WAS ONCE COMMON IN ENGLAND

The hyenas themselves are creatures with a past. They were once common in England, and cracked bones that the sabre-toothed tiger had stripped of flesh. Now restricted to three species and to the warmer parts of the Old World, they continue to crack the bones left by more powerful animals, though they will attack a donkey or bullock if it be tied and helpless.

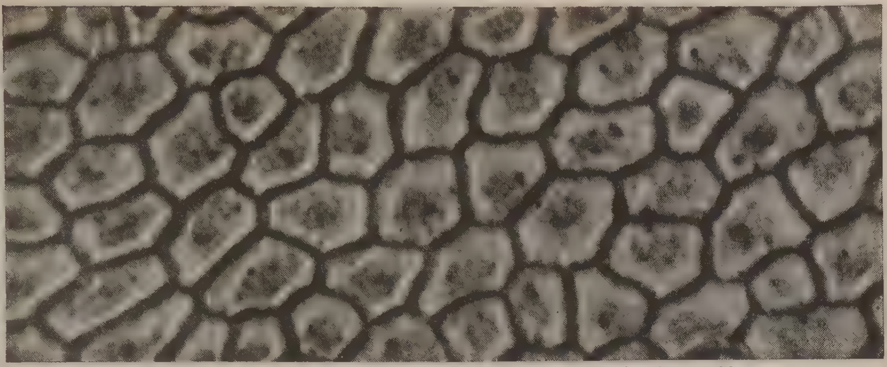
The striped, the brown and the spotted hyena make up the family to-day, the most repulsive of all mammals; powerful, ungainly, ferocious, but cowardly beasts. They will not face a waking man, but they will attack if he be sleeping, or too ill to defend himself. In Syria and Palestine the striped hyena haunts rock-cut tombs; in India it is at home in rocky crevasses. Everywhere it despoils the couch of the dead.

Its chief wonder is the might of its jaws. This feature is most pronounced in the ignoble king of the tribe, the spotted hyena of Africa. Here is a pair of jaws which can crack the thigh-bone of an ox as easily as we should crack a walnut. This is the fiercest of the three species, and will raid camps and kill small cattle and ponies. The brown species, which is the least common, is restricted to South Africa.

THE UGLY MEMBERS OF NATURE'S ORDER OF SCAVENGERS

They are members of nature's order of scavengers. They come after the gigantic feasts of the warrior animals. A lion has a kill and eats seventy pounds of flesh at a meal. The jackal and the vulture follow. But the hyena performs the last rite. He rids the scene of its pitiful evidences of tragedy. He is the living charnel-house, the receptacle of the bones. So even this noisome animal has its niche in the scheme of the living world.

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 597.



The cells of a leaf—the most wonderful laboratories in the world.

BIRTH, LIFE AND DEATH OF A PLANT

CONTINUED FROM 334

LIFE is like a rhythm. There is a time of saving and a time of spending. A period of accumulating energy—the power of doing work—is followed by a period of expenditure. There is winding-up and there is corresponding running-down in the living clock.

Probably this was established at the dawn of life, when simple creatures throve on the energy of the sunlight during the day and lived on their gains during the night. In ordinary green plants there is sunlight capture during the day and manufacture of sugars and proteins; in the darkness this stops, but there may be other internal activities, such as cell-division, fermentation and transport of material from one part of the resting plant to another.

The so-called sleep-position of many leaves, such as the clover, is very different from their position during the day, when they are busy transforming the sun's rays into food. The life of the plant is naturally a see-saw between work and rest, but it is also in tune with the alternation of day and night.

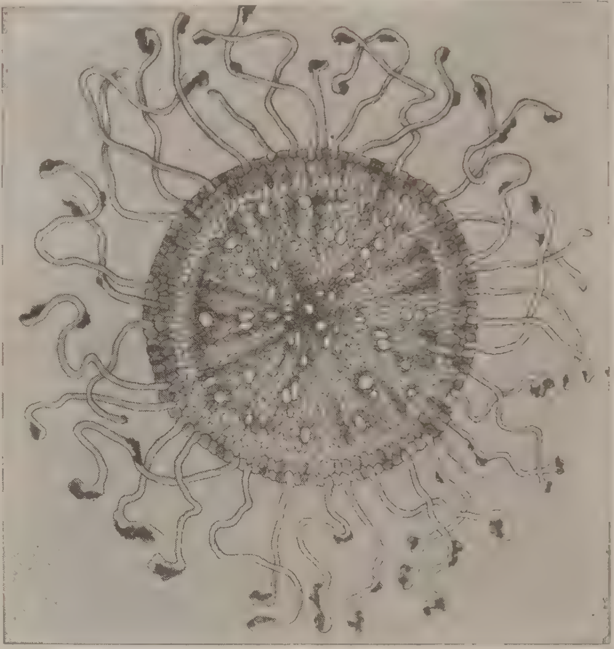
But there is a larger rhythm in the plant's life, and that is related to the march of the seasons. In temperate countries there is the sprouting, leafing, growing period of spring; the maximum industry and the flowering of summer; the fruiting and seed-scattering of autumn; and the entrenchment and rest of winter. Two ways of looking at this must be combined.

First, it is in the nature of every life to have a youthful growing time—the ascending part of the life-curve; then there is a period of maturity and great activity; then a time concerned with reproduction, or the continuance of the race; and finally there is the downward part of the curve during which activity wanes and age leads to death.

There are four great chapters in the life of man—youth, maturity, love and age; and there are four great chapters in the life of a plant—leafing, flowering, fruiting and withering away. These chapters depend on the nature of the organism; they are determined from within.

But the second point of view is that in temperate countries there are regular changes of the seasons; and to these the life of the creature must be adjusted. There are many annual animals, such as an ordinary queen bumblebee. A young queen lies in a sleeplike rest throughout the winter; she awakens in early spring and, after visiting early spring flowers and collecting pollen and nectar, she becomes the mother of a large family. She ceases to go out of doors at all, and her working daughters do everything but lay eggs. She usually dies in the autumn. But among her daughters there are young queens, some of them fertilized by drones, sleepy through the winter and beginning the story afresh next spring.

The point is that the chapters in the life-history are adjusted to the variation of the seasons, and so is it with the plant—with its spring foliage, its summer flowers, its autumn fruits and seeds, and its winter rest, or death. In the case of an annual, the whole life-curve rises and falls with the four seasons; when the plant lives for many years the external ups and downs have to be faced many times, and they leave their mark on the great chapters of life, youth, maturity, maximum vigor and age. The annual plant has its single spring in its youth; the perennial plant has many springs, and enjoys a period of youth and renewal every year.



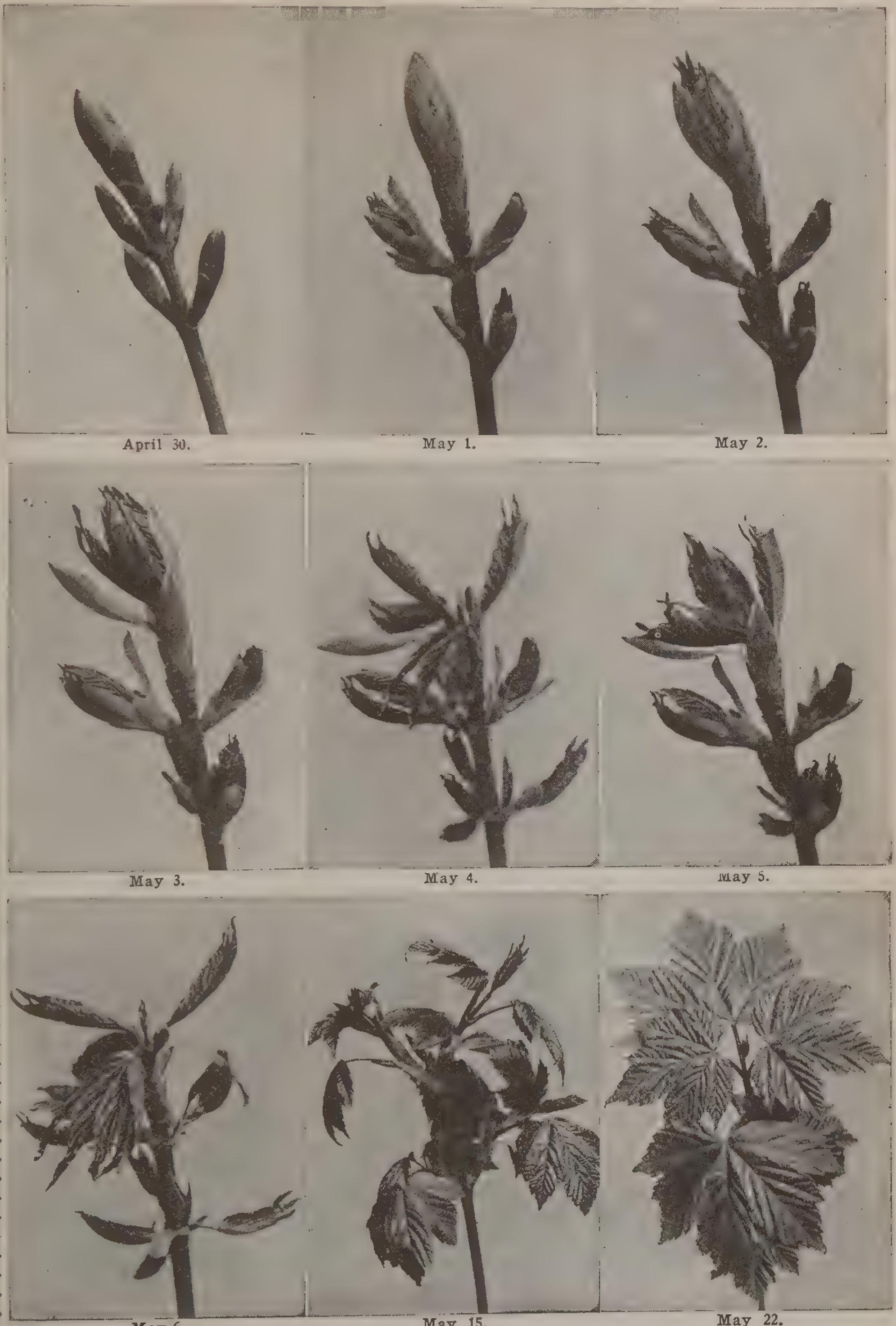
This drawing of a section of the root of a plant shows the fine root-hairs through which the plant obtains nourishment from the soil. Particles of earth may be seen clinging to the root-hairs.

Spring is the season of young things, and we see this in the crowds of seedlings that rise from the ground. The seeds were formed in the sunshine of the previous season; they were scattered and sown in various ways when ripe. They have lain dormant in the ground through the cold and storms of winter. But the waiting has not been a mere marking time; there have been preparations within the seed itself.

Toward the end of winter, if we unearth some of the seeds in the ground, we find that their protective envelopes have been weakened by rotting. Bacteria help in birth. As the spring showers moisten the ground and the water soaks into the seeds, the living matter reawakens, and this is helped by the rise of temperature. The stores of starch and proteins in the seed are fermented and thus made available for the young plant, which develops rapidly and bursts out. The young stem grows toward the light, and, rising above the surface, moves slowly round and round, bending and bowing to the different points of the compass. The young roots grow downward and they also move in the cavities in the soil. The first leaves are expanded in the light and air, and when they are thickly sown there is often keen competition among neighboring seedlings.

Another feature is the opening of the leaf-buds. They, too, were formed in the plenty of the previous season. They are young shoots with closely packed young leaves—well wrapped up in tough bud-scales, often varnished with resin—which keep out the moisture during the cold weather. The spiral arrangement of the young leaves inside these protective coats allows many leaves to be economically packed away in a small space. The spiral arrangement in the bud corresponds to the spiral arrangement of the full-grown leaves on the branch or stem, and there it has the advantage of lessening the risks of the overshadowing of one leaf by another. It will be understood that the full-grown shoot is due to the lengthening-out of the minute axis in the core of the bud. The two main triggers that set a-going the activity of growth within the bud are the rise of temperature in the spring and the ascent of sap from the stem. Living matter

THE LEAF OF THE SYCAMORE OPENS



April 30. May 1. May 2.

May 3. May 4. May 5.

May 6. May 15. May 22.

THE DEVELOPMENT OF THE WINTER BUD OF THE SYCAMORE INTO FULL LEAF contains seventy or more per cent of water, and the increase in the amount of living matter implies plenty of watery sap.

If we look in spring at a cut surface on a birch tree, where a branch has been lopped off, we see that it is very wet. This is an overflow of the sap which is ascending from the roots. It is possible, by inserting a tube into the young wood of a tree like the maple, to show that the sap rises with considerable pressure, and this pressure has often been measured. This ascending sap, which comes up from the roots through tiny tubes in the young wood, consists of soil-water and dissolved salts. It is necessary for the reawakening and growth of the buds, and for the manufacture of carbon compounds in the sunlit leaves.

THE WONDERFUL AND DIFFICULT PROBLEM OF THE CLIMBING SAP

We cannot give a short answer to the question What causes the ascent of sap? but the two most important factors are root-pressure and the giving-off of water-vapor from the leaves. The soil-water passes by diffusion through the surface of the rootlets into the concentrated sugary fluid of the living cells. As a cell receives fresh supplies it passes on its surplus water to another cell, thus enabling itself to absorb more water from the soil.

Thus the water passes with considerable pressure up the stem from cell to cell: perhaps it brings to mind the way firemen used to pass buckets of water from hand to hand. But then there is another process, working from the leaves backward and downward, for the using-up of water in the leaves, and the loss of water-vapor into the air must make one cell more dense than another, so that it is able to draw on its neighbor. But it is a difficult problem—the ascent of sap.

THE POLLEN-GRAIN THAT STARTS A NEW FLOWER ON ITS WAY

As we have seen, summer is the time of the plant's greatest activity. Then foliage is at its best, there is the richest supply of sunshine, and the process of splitting up carbon dioxid and building up carbon compounds is at its height. There is an enormous chemical industry going on, though all is so quiet!

But no one can fail to associate summer with flowers. Although there are many spring flowers, in some climates there are more in summer, and spring flowers are usually, though not always, of paler colors. White and yellow flowers are common in spring; reds, blues and purples are more characteristic of summer.

Just as the leaf is an organ through which food is taken, so the flower consists of the organs of reproduction. It was a great discovery, part of the credit of which rests with the poet Goethe, that a flower is made up of four whorls of transformed leaves. In the centre, at the top of the floral axis, or flower-shoot, are the carpels which produce the possible seeds, or ovules, each containing an egg-cell, which will develop into an embryo plant if it is fertilized by the pollen from a stamen. The next tier consists of stamens, whose heads, or anthers, produce the fertilizing golden-dust, or pollen, which is carried by insects or by the wind from blossom to blossom. Each pollen-grain includes a male element, or nucleus, which unites in an orderly way with the nucleus of the egg-cell when a tiny outgrowth from the pollen-grain, the pollen-tube, penetrates into the ovule.

On the tier below the stamens are the petals, forming the corolla. They are in most cases brightly colored, and they help to attract useful flower-visiting insects in various ways—by their brilliance, by their fragrance or by producing nectar, or by several of these methods at once.

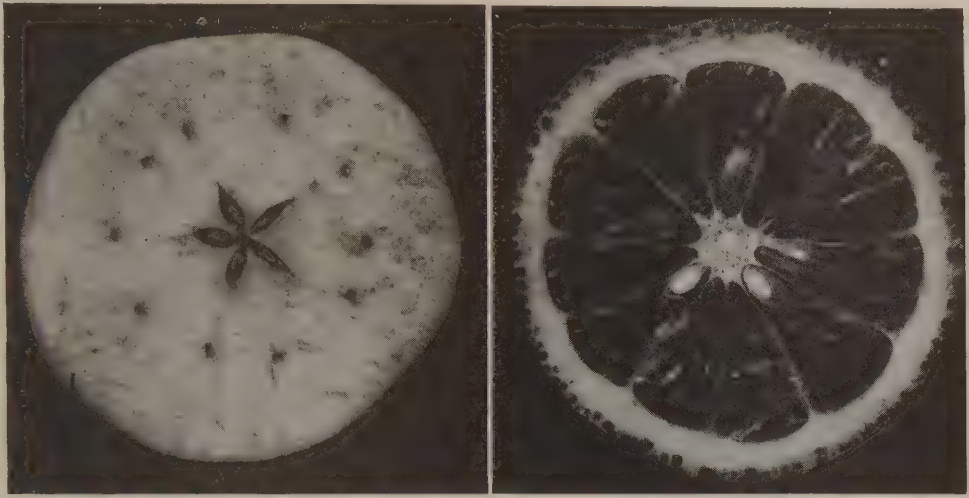
THE SUMMER-TIME, WHEN LIFE IS QUICKENED EVERYWHERE

The petals often shelter the essential parts from the rain; they may ward off useless intruders; and they make certain that welcome visitors, such as bees, get well dusted with pollen.

Lowest of all are the sepals, forming the calyx, usually green and substantial, protecting the rest of the flower during the bud-stage and steadying the upper tiers against the wind. In many cases the calyx, or part of it, is carried on into the fruit, as is familiar to everyone in strawberries from which the green part has not been removed. In some cases the sepals are brightly colored and help to make the flower attractive, and it may be noted that nectar may be produced by various parts of the flower besides the petals.

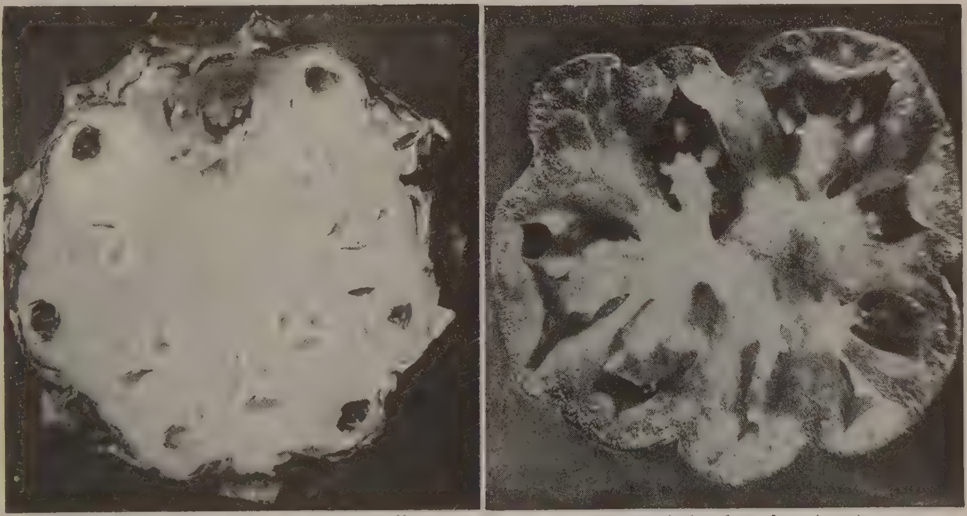
But the big thing is this: the flower consists of four tiers, or whorls, of transformed and often glorified leaves—sepals, petals, stamens and carpels. As John

Ruskin said, "when leaves marry, they put on wedding-robes, and have feasts of honey—and we call them flowers." The flower is the crown of the plant's life, and perhaps botanists will some day recognize that Darwin's grandfather, Erasmus Darwin, was not wholly fanciful in writing a long poem on *the loves of the plants.*



The seeds of an apple.

The seeds of a lemon.



Pineapple seeds sheltered by the wall.

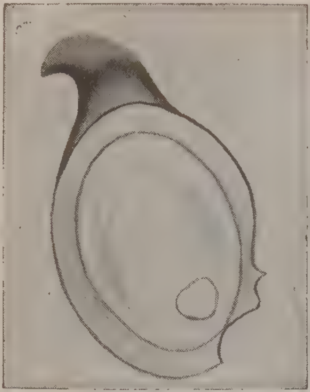
The seed chambers in a tomato.

THE BEDS THAT MOTHER NATURE MAKES TO PACK HER FRUIT CHILDREN IN.

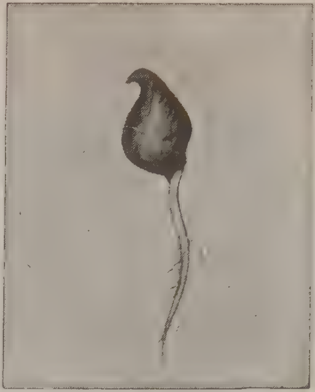
Summer is the time when the earth gets its largest supply of solar energy. Much of it warms the land and the sea and the air, and so quickens life. But much of the energy is in the form of light. This is health-giving in many ways, quickening the pulse of life, and in some cases *energizing* animals. However, its chief importance is that it is a source of energy to green plants. These trap it so successfully that they accumulate more of it than they can possibly need. They thrive and grow, they multiply and spread. Remember all the more adventurous life of animals depends in the end on the large capital that plants place so liberally at their disposal.

All higher plants, especially the ordinary flowering plants, are very complicated organisms. There is great intricacy in their make-up, as, for instance,

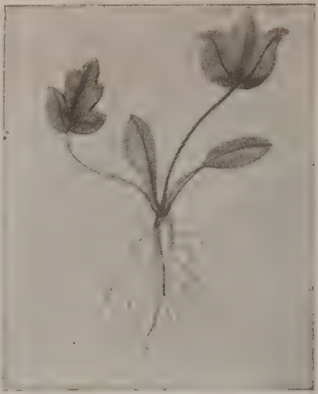
THE LIFE-STORY OF A BUTTERCUP



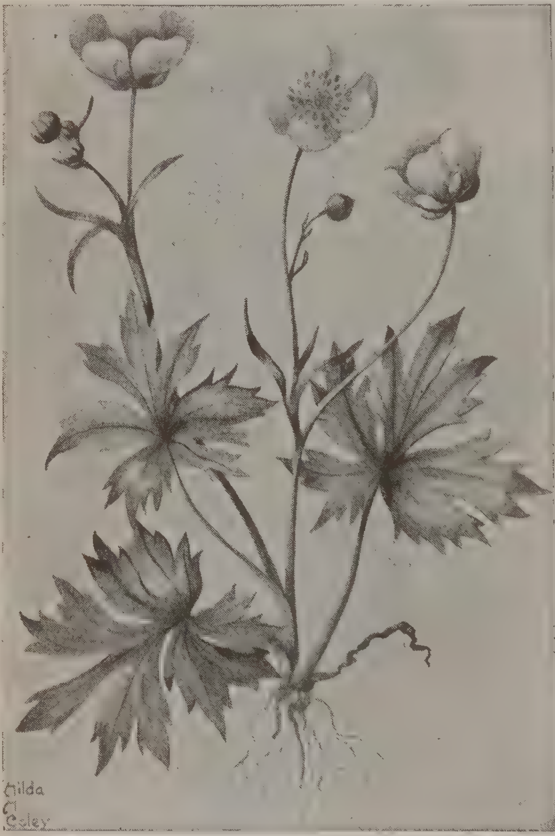
1. The seed of a plant is like the egg of an animal, the product of two parents. Here is the seed of a buttercup inside the seed-vessel, or ovary, of the flower, with the young plant, or embryo.



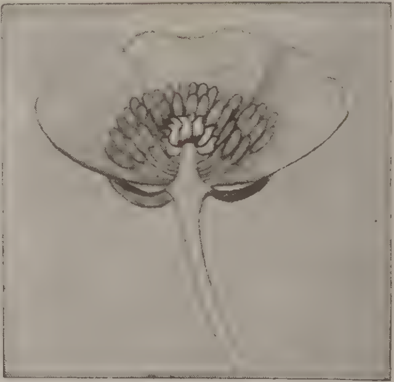
2. The seed, which we call an ovule, absorbs water, and chemical changes also take place inside which cause it to sprout, or germinate, throwing out a tiny white thread which is the root.



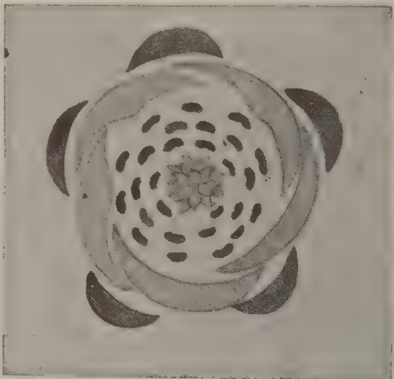
3. The seed-coat now bursts open and a stem begins to grow upward, which we can see is a continuation of the root. Presently tiny leaves that were folded up tightly inside the seed begin to open out.



5. The plant now grows rapidly, until at last we have a perfect buttercup with stem, leaves, flowers and roots—a wonderful work of art containing within itself all the power of carrying on the race. We should appreciate the beautiful flower more if it were rare and costly instead of common.



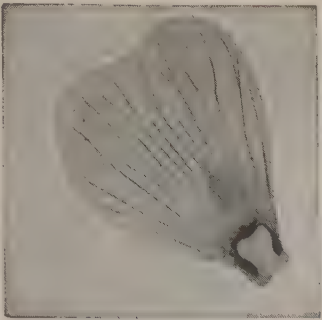
4. The flower is not only beautiful to look upon, but is also a very wonderful and complicated piece of work, as we can see if we cut a buttercup down the centre.



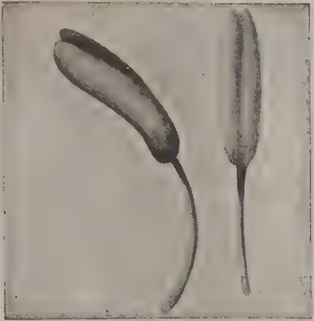
6. Still more wonderful is a horizontal section of the flower, showing the arrangement of the parts. In order are the five green leaves, or sepals, then the five yellow petals, pollen-bearers and carpels.

These pictures show the wonderful life-story of a flower, the flower chosen by our artist being the common meadow buttercup. We see it from the seed to the flower and from the flower to the seed again.

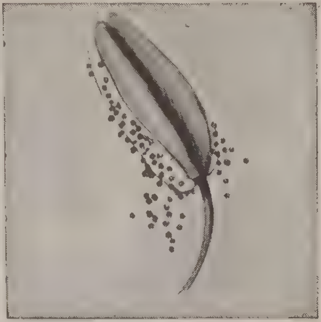
HOW THE RACE OF FLOWERS IS CARRIED ON



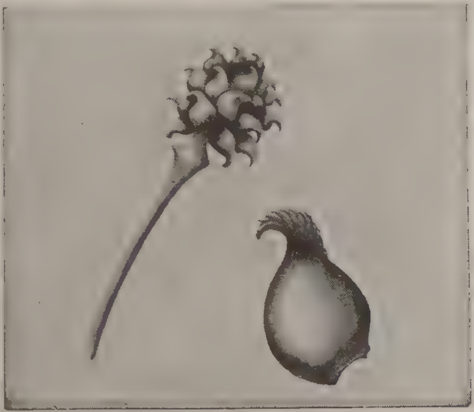
7. If we take one of the yellow petals, we shall find at its base a tiny pocket, or gland, called a nectary, containing a honey-like fluid which attracts insects.



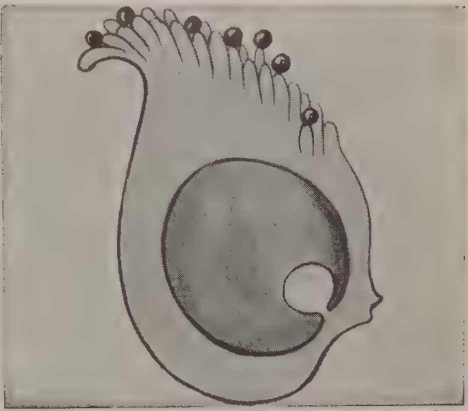
8. These are the stamens of a buttercup. Both a back and a front view of one are shown. The stamen is divided into pockets called anthers, containing pollen.



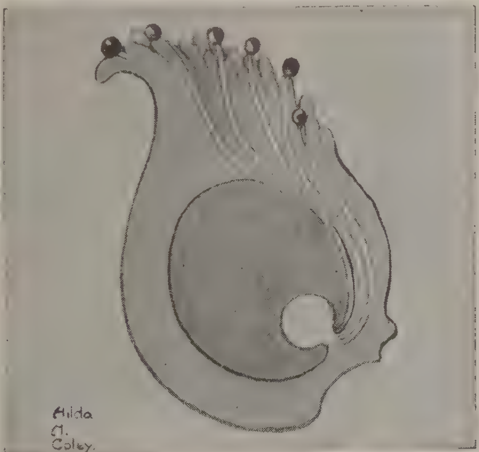
9. Here is another view of a stamen, showing the anther open and shedding its pollen in the form of a fine powder consisting of tiny grains.



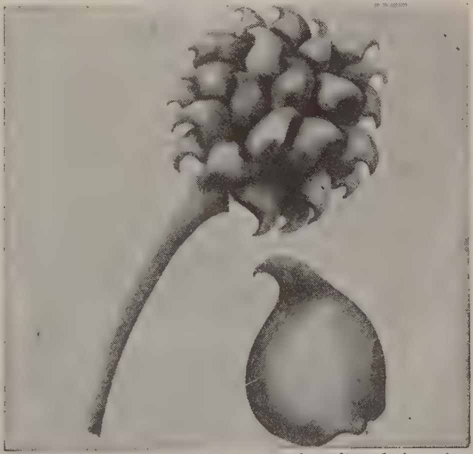
10. The seed-organ, or pistil, of the buttercup is made up of a number of modified leaves called carpels, clustered round the top of the flower-stalk; this shows such a cluster of carpels, with one magnified.



11. The top of the carpel, called the stigma, receives the grains of pollen from the stamen, and here is the pollen resting on the stigma, while inside the seed-vessel, or ovary, a seed is waiting to be fertilized.



12. A sticky substance on the stigma holds the grains of pollen prisoner, and these at once begin to form little tubes which make their way down into the ovary and penetrate the seed, so promoting fertilization. The seed is in this way made capable of producing another plant.



13. Here is a cluster of carpels after being fertilized, one detached showing the seed developing. This brings us to the stage of our first picture, and now we have to imagine the whole process going on again. A buttercup will fertilize itself, but the plant is stronger if the pollen is from another plant.

Everywhere the principle is the same in all cases, but the buttercup has been taken for the purpose of these illustrations. In the buttercup, as in many other flowers, both parents appear on the one plant.

in the architecture of a green leaf. Each cell is like a laboratory. When there is much work being done in transforming matter and energy from one form to another, there is bound to be wear and tear in the furnishings of the laboratory—that is to say, in the microscopic framework of the living cells. In other words, *growing old is inevitable.* As Shakespeare said:

> And so, from hour to hour, we ripe and ripe,
> And then, from hour to hour, we rot and rot,
> And thereby hangs a tale.

To a long-lived plant every spring and summer bring opportunities of becoming more or less young again, and this is taken advantage of. Age is staved off, but in the end it wins. In many other cases there is a sacrifice of hard-worked parts, and the plant sheds what has become a source of weakness. We see this in the falling of the dead and exhausted leaves of trees. But there are limits to this saving of the life by losing it. In the end age must win, and what we see so plainly in autumn is the waning of life, either for the year or forever, as far as the individual plant is concerned.

The fall of the leaves is a sign of autumn. They have worked hard; the furnishings of the laboratory show wear and tear; the leaves are growing old. Moreover, with lowered temperature and frozen ground they could not continue the use they make of water. The supply cannot be kept up, and even if water were available, it would be liable to freeze in the leaf and burst the cells. Thus the leaves *have to fall,* and it is well for the plant that this should be so.

THE WITHERING AND FALLING OF THE LEAVES IN AUTUMN

A very interesting point to remember is that before leaves are shed there is a movement of most of the useful material into the stem of the plant. The remnants of the green coloring matter (chlorophyl) account for the color of the leaf when it is ready to fall.

And along with the withering and the fall of the leaves we must take the dying-down of the stems of many plants, so that nothing is left exposed to the cold of winter. If a sudden frost comes, the parts above ground may be killed in a night while there is still much life in them, and that means great loss to the plant. When cold sets in gradually, there is a retreat of almost all matter that is valuable into the root. Thus, what withers and is swept away as rubbish is often as empty as a fallen leaf.

But there is another very distinctive note in the life of the plants in autumn. Just as we associate sprouting and leafing with spring, and flowering and intense growth with summer, so we must recognize autumn as the season of fruiting and seed-scattering. The fruit is what we may call a ripened ovary, as some plants do not produce seeds. Stamens and petals fall away; the sepals often wither; the supplies which may still be coming up the floral axis are taken by the fruit, which often becomes quite large, or into the seeds, which receive a useful legacy of proteins and fats.

HOW THE PLANT SAVES ITS LIFE IN HARD TIMES

As the flower withers the nectaries close, and sugary material which overflowed in these glands may be taken by the fruit. Besides juicy fruits, there are multitudes of dry pods and capsules, which liberate the seeds by breaking up; though changed in appearance, they are really modified foliage-leaves, and it is natural that they should wither.

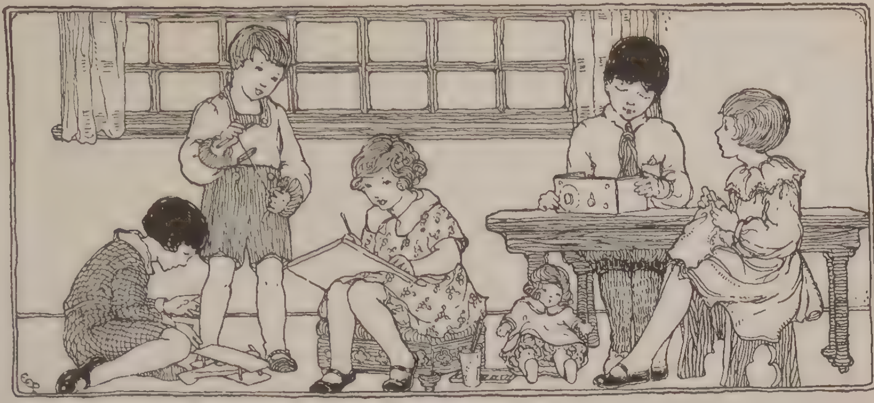
In the temperate countries of the northern hemisphere most plants pass into a state of rest. The leaves have fallen; the buds are well wrapped up; it may be that there are no parts left above ground; there are stores in underground parts; the seeds are sleeping in the crannies. This is partly because a rest is needed after great activity, and partly because of the cold of the winter.

Evergreens, like the holly and the pine, have leaves specially suited, by their tough skins, to stand the cold and to go on slowly capturing winter sunshine; but we have only to walk under these trees to see that their leaves also have a very limited life. They fall off piecemeal, as it were, not all at once.

THE PAUSE IN THE PLANT'S LIFE BEFORE A FRESH START

Then there are woolly plants, as the mullein, which are so well wrapped up that they do not need to die down as so many of our plants must. Besides evergreens and woolly plants, there are many exceptional cases, but these do not affect the truth of the general idea that winter is a time when the fires of life burn low.

THE NEXT STORY OF PLANT LIFE IS ON PAGE 613.

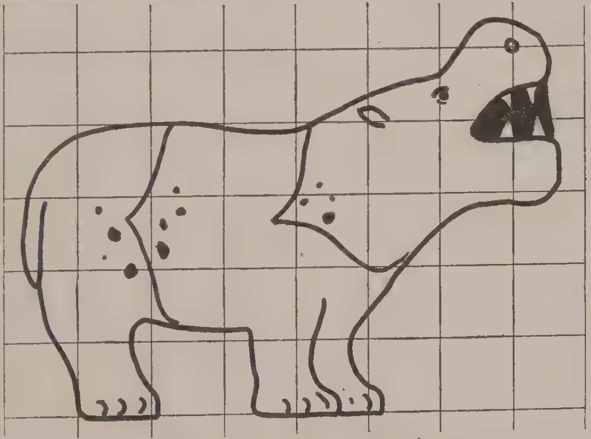


TOY ANIMALS FOR YOU TO MAKE

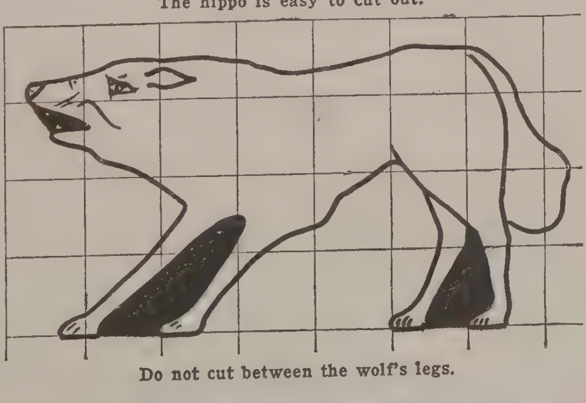
CONTINUED FROM 344

HERE are three toy animals for your circus, which can be made from thin soft wood or even from the tops and bottoms of old cigar boxes. Directions for making other animals for your menagerie are given in other volumes, but you will find it easier first to make the bear, the wolf and the hippo as shown in the following patterns.

While some children copy patterns from their animal books, you will find it quite easy to make your patterns for these animals if you first lay out your sheet of paper in 1 inch squares. As the bear, the wolf and the hippo have each been drawn on squared paper just like yours, you may count each square in the picture as 1 inch and note the general proportions of the animal. This enables you to make several marks or dots as guides for drawing the rough outline of the animal in question. Now carefully check your drawing with the corresponding one shown in this book and make any desirable final changes in your pattern.



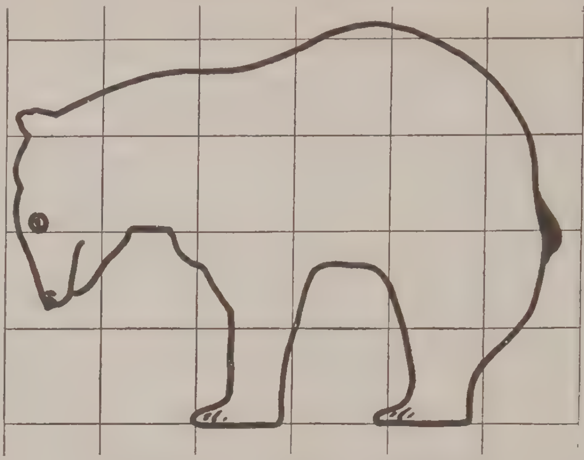
The hippo is easy to cut out.



Do not cut between the wolf's legs.

Your pattern may now be transferred to the thin wood (this should be not less than ⅛ inch nor more than ¼ inch in thickness) either by using carbon paper or by cutting out and tracing on the outline with a pencil. If you have decided to use cigar boxes, these must first be cut apart and the tops and bottoms should be made smooth by scraping or sandpapering. Cedar, from which most cigar boxes are made, is well adapted to the purpose unless heavier toys are wanted.

The animal is next shaped either with a scroll saw or by whittling. The cutting should be done very carefully, as the outlines make so many different angles with the grain of the wood. It is not in the least like straight cutting with the grain, or even straight cross-cutting, and the wood sometimes has a way of splitting off an important part of the animal's anatomy. Sometimes much of this difficulty with short grain can be prevented by noting the direction of the grain in the wood before the pattern is transferred.


Watch the grain of the wood in making the bear.

A base is next needed upon which to mount each animal. Each one of these should be at least 1¼ inch wide, and about as long as the total length of the animal. After each animal and its base have been sandpapered and balanced, the base is carefully nailed to the animal's feet with two or more small brads or nails.

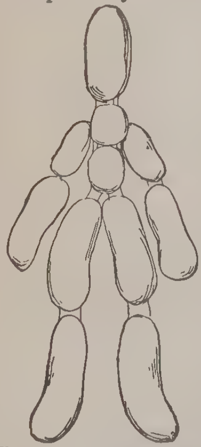
Now you are ready to give the animal his color. Any spots or other decorations which you decide to put on these animals should be painted a bright color with common oil paints or with water colors. In fact, these should be painted brighter than is actually desired. If used, water colors should be applied with a brush not too full of color. Care should be taken that it does not spread into the grain of the wood. When this or the oil paint is dry, an oil stain of the proper shade can be rubbed over both wood and decoration with a soft cloth. Later it should be rubbed down with two or more coats of wax. If only common oil paints are used the spots and other markings should be made after, rather than before, the first coat is applied. The colors for each animal will be left to your judgment. For example, you may paint the bear brown, black or white, depending upon which one of these bears your toy most closely resembles. But what colors are proper for the wolf and the hippo?

You will find suggestions for making three more wild animals for your menagerie on page 895 in Volume Three.

JOHN CHINAMAN MADE OF PEANUTS

JOHN CHINAMAN is one of the oddest-looking men in the world, and we can make the oddest John Chinaman doll that you ever saw out of a simple bag of peanuts or monkey nuts.

The doll shown on this page is made from eleven peanuts threaded together. By looking at the first picture you will see how the peanuts have been chosen—a large one for the head, two smaller and two larger ones for the body, two more for the upper part of the arms, with a larger one below each to complete them, and two long, curved nuts for lower parts of legs and feet. String them together with strong cotton, as shown in the picture; then draw the face with a black lead pencil or in ink, giving the eyelashes a slanting line to make them look like a Chinaman's.


The nuts strung together.

Take three pieces of black wool and braid them together; this will form the pigtail, which you can stick with glue at the top of the head, or fix by means of the strong cotton used to thread the peanuts. To dress this doll, make a little pair of trousers with two square pieces of bright-colored material; hem each piece on one side, and join halfway at the back; then join the two together.

The smock is made in the shape of a little sack. simply drawn in at the neck. Two very wide sleeves are next made, each one like a small bag, sewn on the smock quite close to the neck. When choosing the materials for these Chinaman dolls, it is better to secure bright reds, blues and yellows, as these give the prettiest effects.

The hat looks very nice made out of two round pieces of cardboard, covered with silk, and joined together with a little silk cord overstitched all round. It is kept in place with a colored glass-headed pin stuck right through the head.

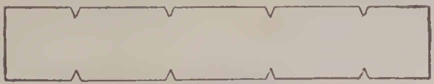
The black lines seen on the smock can either be made by putting a little braid round the bottom and at the edge of the sleeves, or by working on it some fancy feather-stitching. If you will paint in the shoes with a little black paint or china ink, it will give John a good "finish."

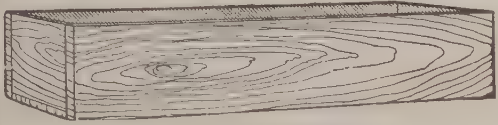
John Chinaman dressed.

If you think John will be lonesome, you can easily make a "Mrs." John. Make her smock a little longer than her husband's, and glue more wool on her head. A wee Chinese baby can be made out of a chubby peanut. All that has to be done is to draw the face; then wrap it in a tiny square of cloth.

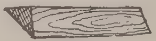
MAKING A FLOWER-BOX FOR THE WINDOW

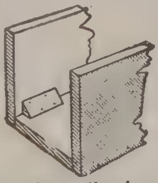
ONE of the easiest things for a young amateur carpenter to make is a box for the sill of the window outside, in which he may plant flowers. It is not the good fortune of everybody to have a garden plot, in which the taste for gardening may be encouraged and developed, but everyone has a window-sill, which he or she can make a source of delight and beauty. Even if one has a garden it is good to have a display of growing blossoms on the window-sill; it cheers the most sombre street; and if everyone did his best to beautify the street in this way, even the poorest quarters in our large cities would be brightened and made to wear Nature's smile. The expense of keeping a flower-box is almost nothing at all, especially if we make the box ourselves.

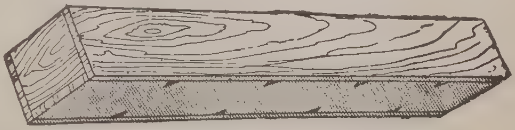

1. Shape of bottom of box.


2. Box nailed together.

The box which we make should be as long and as wide as the window space will allow. Now, as windows are not uniform in size, no measurements that we could give here would fit every window. Thus, everyone must make a window-box that will fit the window into which the box is to be placed. We will suppose that our window has space large enough for a box 36 inches long and 8 inches broad. In this case we shall want one piece of wood 36 inches long and 6 inches wide for the bottom of the box. This should be fairly thick, not less than 1 inch, and if it is thicker than this it will do all right. We should have a number of holes in the bottom of the box to allow the water to run away when there has been too much put in. If the water were not allowed to run away, it would turn the soil in the box sour and prevent the flowers from growing. The easiest way to make the holes would be by using a brace and bit, but perhaps we do not have one of these tools in our outfit. So we shall do as well with only a saw or a chisel. We can make a lot of wedge-shaped notches in the edge of the bottom, say, four on each edge, as seen in picture 1, and these will make the holes, when the front and back pieces have been nailed to the bottom. Now we require two pieces of wood 36 inches long and 8 inches wide; these are for the front and back of the window-box. These pieces may also be 1 inch thick, although they will do ¾ inch thick, but they should not be thinner than this. We need two end pieces, and they should be thick — not less than 1 inch, and preferably 1⅛ inches or 1¼ inches. The size of the two end pieces should be 6 inches wide and 7 inches long. Now we nail the pieces of wood together as seen in picture 2, the bottom and the sides going right from end to end, and the front and back sides coming down in front of the bottom. The bottom of the box, when nailed up, will look like picture 3, where we see the holes left for drainage. The end pieces go on top of the bottom and within the sides. The box is now made, but we can make it much stronger by nailing on strengthening pieces at the corners inside. These strengthening pieces should be triangular, like picture 4, say, 1½ inch wide, and if we nail some of these in the corners, both at the ends and into both the front and back bottom corners, it will strengthen the box very much. We should nail them to both the pieces against which they are placed, as indicated in picture 5.

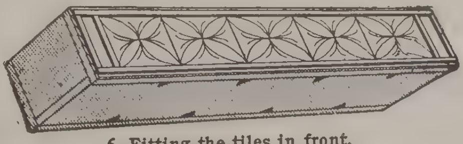

4. Strengthening piece.

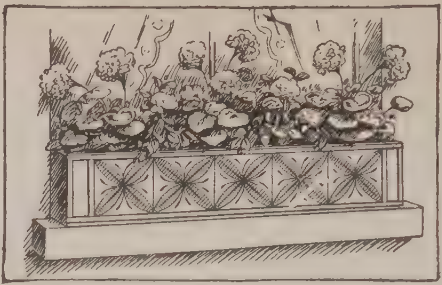

5. Strengthening piece nailed on.


3. Box showing holes for drainage.

It will be easy to take the sizes for these pieces, but we must be careful not to cover up the drainage holes with the strengthening pieces. The box is now made, and we have only to paint it; the color should be a leaf-green, and we should give it not fewer than two coats.

Sometimes the front of a window-box is fitted with ornamental tiles. We can do this also if we like. We can usually buy from a carpenter or builder some odd hearth-tiles for a trifling sum. We had better have them 6 inches square, which is a common size, and they should all be of the same pattern if possible. We should require five for a box 36 inches long. We must measure to see what room the five tiles take on the front of the box. We can place them on the front of the box, which we have laid on its back. Then we nail on, right along the front at the top, and right along the front at the bottom, slips of wood about ½ inch thick, or a little less, and about ¾ inch wide, as seen in picture 6. The thickness of these slips should be the same thickness as the tiles. Now we nail on similar slips at each end, close up to the tiles, and if there is room at the end, yet other slips right at the ends of the wood, all as seen in picture 6.


6. Fitting the tiles in front.



7. The completed window-box.

Now we nail on other slips above these, and coming just a little way over the edges of the tiles so as to prevent them from falling out. It will be much better if we paint all these slips before nailing them into their places. We will, of course, have them leaf-green, the same color as the box itself. When we have done all this, we shall have made a very attractive window garden, such as is shown in picture 7, which shows it fitted into a window.

After we have placed the box in position on the window-sill, and before we put earth into the box, we should put in broken pieces of crockery along the bottom 2 inches deep.

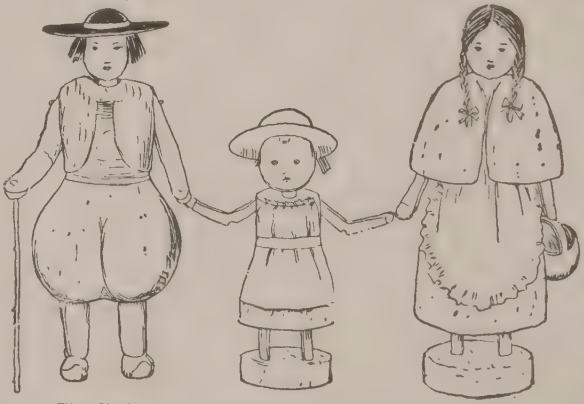
This is necessary if we are to have proper drainage, because it is bad for flowers to be in sodden earth, from which the water is not free to run away. Then we put in the earth up to within ½ inch of the top of the box, and when we have decided upon the plants or flowers we are going to have, we are ready to put the seeds, plants or cuttings into our box.

It is well to choose for a window-box flowers of brilliant color which grow to be good big blossoms; to be effective it should have a good appearance from a distance.

Instead of filling the box with earth, we may have flower-pots standing in the box and containing the plants. This is a very good way, and enables the plants to be changed so that we can always have flowering plants in the window if we wish. Then, as the seasons change we can change our plants to have always blooms that will flourish.

BOAT, RAFT AND FAMILY MADE OF CORK

A LARGE flat cork, such as every mother can find, will make a little sail boat which you may enjoy. As shown, all that is needed is to make a small stick mast and a white paper or cambric sail which may be cut to the proper size and fastened by tacking or gluing. Several smaller corks of about the same size can be used to make a toy raft. If you wish to make a good-sized raft you will need to collect a number of corks. They should be of about the same length, as well as of about the same diameter. First fasten together with toothpicks (any small strong sticks will do) either four or five of these corks by placing them end to end to form a little cork log. Make several of these logs, and then fasten them together either with toothpicks or by tacking securely two or more thin strips of wood which have been cut as long as the raft is wide. Another way of making the cork raft is to secure a fine wire on which to put the corks. The logs may also be wired together by this method.



The little Dutch family made out of ordinary corks.

The quaint little family in the picture comes from Holland and is made out of cork.

The whole body of the woman is one solid cork, which has just been carved out a little with a penknife to form the outline of the cape.

For the head a smaller cork will do—one out of a medicine bottle, for example. Shape it round with a penknife and stick it to the body by putting a piece of matchwood in the body and the head on the top. A pin will answer the same purpose. Frayed string or silk will do for the hair, which is glued on the head.

A mark with a black pencil or with pen and ink will make the eyelashes and nose. Use a blue pencil for the eyes and a red one for the nose and mouth. Two little pieces of matchwood stuck at the side will do duty for the hands, and two underneath will make the feet. These should be stuck in a flat olive-bottle cork, which makes a good stand for the little woman, who will look quite charming with a muslin-and-lace apron fixed on with two pins under the upper part of the cork.

The little basket which she holds in her left hand is made out of a pecan, neatly carved in two semicircles to shape. The nut is, of course, taken out to leave the basket hollow.

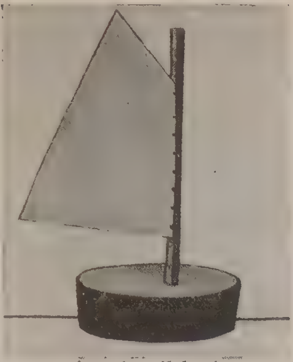
The man is made of exactly the same material, the cork being used upside down. The outlines of the coat and waistcoat are shaped with a penknife. Buttons may be put on the waistcoat by ordinary short pins pushed in the cork. The little arms are cut out in cork or, what is more simple, made of the little twigs of a tree, fixed on to the body with pins, being thus movable. The legs and wooden boots are also cut out of cork, the head and face being treated in the same way as the woman's.

The head is formed of a rounded bottle cork. A circular piece of cardboard is cut out for the brim of the hat, and the top of the head, which comes through the cardboard, is painted the same color as the hat, and has a tiny ribbon tied round to make it look like the crown.

The stick is made from a colored match from which the top has been cut off.

The baby boy is made from an ordinary cork put upside down. Two matches make the legs, which are stuck on a flat circular piece of cork to make the little boy stand. The two arms are also made from bent matches. The hat is made in the way that has already been described.

No family is complete without an animal member, so we must use some corks to provide four-footed friends. A cylindrical cork, out of an ordinary small-mouthed bottle, will make a body for a horse. Four matches will do for legs. A smaller cork will serve for the head, and a match will make a neck. Black-headed pins can be stuck into the head to give the horse shiny black eyes. And a bit of wool can be glued to the rear end of the large cork to give the animal a flowing tail. A bit of felt can be glued on the horse's back to represent a saddle. Small bits of brown felt, cloth or paper can be glued to the head cork to form ears. This corky steed will prove to be "sound in wind and limb."

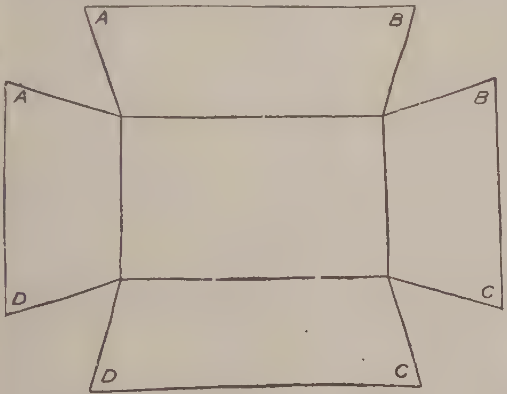


A cork sail boat.

HOW TO MAKE A GIRL'S WORKBOX

HAVE you ever thought of the joy it brings to have a real workbox of your own? Let us try to learn to make a box like the one in the picture.

Take a piece of cardboard thick enough to make a firm foundation, and on this trace the lines above. Cut the cardboard all around the outlines of the diagram. Bend the four pieces which are intended to form the four sides. Do this while following the lines carefully, so that the bottom of the box will be quite even. Straighten the cardboard again, and cut two pieces of cretonne, each one covering entirely the piece of cardboard which includes the bottom and sides of the workbox. Cut the material about a quarter of an inch bigger all around than the cardboard, to allow for turning in the edges, which otherwise would fray and look untidy; then glue the cretonne on the cardboard, back and front. When this is done, let it dry for one day.

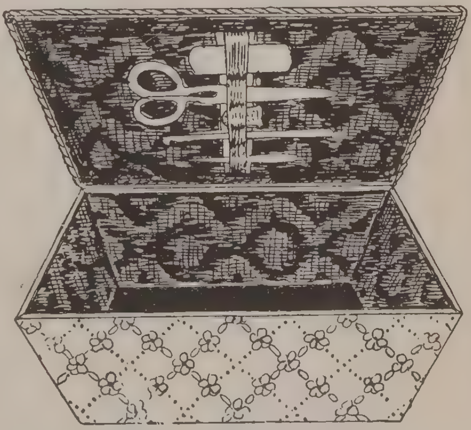


The pattern of the girl's workbox.

The next thing to do is to bend your covered cardboard again, just as you did before. This will be quite easy now, for, although you cannot see the lines, the cardboard will bend naturally and without any difficulty in the same place. Join the corners A together by sewing the cretonne on the two sides with over-and-over stitches, using a needle with strong thread to secure the corners, top and bottom, very firmly. The same thing must be repeated in the corners marked B, C, D.

The workbox now stands, and is covered and lined. Some cord sewn round the foot of the box will make a neat finish and slightly raise the box. Now the cover must be made, and this is the most interesting part of the work. Cut a piece of cardboard to fit exactly the top of your workbox; then, before putting on the cretonne as you have done on the other part, put a layer of cotton-wool to form padding, and cover it over with the material. Do this on both sides of the cardboard, taking great care to turn the edges in, as described for the other part of the box, before gluing the cretonne down. A strip of material is fixed on the inside of the lid, and sewn at regular intervals, to receive a thimble, a pair of scissors, a crochet needle and other things. The cover is then put on the box part by slipping two small pieces of cretonne under both cover and back of box, one on each side, to form hinges. These are then sewn very firmly, so that the lid can be opened and closed without getting torn or unstitched.

A silk cord running all round the top will hide the joining of the cretonne, back and front, and can be sewn with light, long stitches, tacking the cretonne on both sides, thus making the edge of the box quite firm and neat. This gives a pleasing finish to the box.



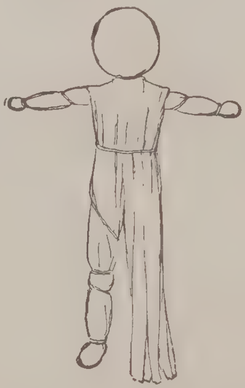
The workbox lined and ready for use.

HOW TO MAKE LITTLE RED RIDING-HOOD DOLLS

WOULD you like to make your own dolls? I know how very much nicer and dearer to us are the toys which we have made ourselves out of scraps, and so I am going to tell you how to make a lot of lovely things which your friends will never believe were made by little nursery folks. We will make a whole family of dolls, and we will name them after our friend Little Red Riding-Hood.

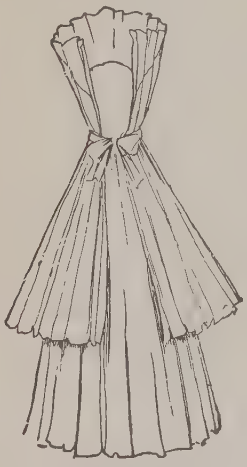
We will start with a doll like the one in picture 3 at the bottom of this page. Doesn't she look quaint and pretty in her little cloak and hood? Well, you can make a whole family of these, with nothing but paper, for a few cents!

First buy a roll of assorted crêpe paper, such as is used for making lampshades and flowers. By asking for the assorted kind you will have in one roll several sheets of paper of different colors, a most important point to remember if we are to dress our dolls. To make the body, take a piece of pink paper and roll it to form a ball about the size of a big marble. This will make the head. Now have a large sheet of the same crêpe paper about 14 or 15 inches long, and draw it several times through your hands until it is as narrow as the round piece which forms the head. Place this ball in the centre of the paper, and then fold it over and tie a piece of cotton quite tight under the ball. Now we have made the head.



1. The body of the paper doll.

The next thing is to make the arms. These are made together by creasing a piece of the paper about 18 inches long very tightly, and folding the ends over until they almost touch each other. Tie them firmly at each end to form the wrists, and again near the centre. This will look like a long roll, which you will slip just under the head between the folds of the pink crinkled paper. Another piece of cotton must now be wound tightly round under the arms to make the shape of the upper part of the body.



2. Cloak for paper doll.

Our doll begins to look hopeful, and we can see already a little of her shape. But the most important part remains to be done, so we will begin to make the legs. For these we must slit the part of the paper which remains from the body, and wind a piece of cotton round each side to form the thighs, knees and legs, folding the ends of the paper under to shape the feet, as our first picture shows. These will be covered with black tissue paper to represent the little shoes.

For the face you can cut out a picture-head of a child which you will find in any paper or magazine, and gum it on to the head-part of the doll, coloring the face pink for the cheeks, blue for the eyes, red for the lips, and brown for the hair and eyelashes.

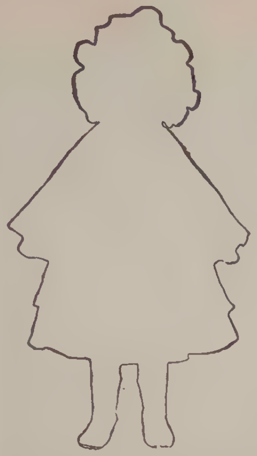
The doll now needs only to be dressed. A short piece of any colored paper you like will do for the dress, but it must be wide enough to go right round the little lady. Cut the paper exactly the length of the doll from neck to halfway between the knees and the feet. Then stick the edges of the paper together at the back; pass it over the head, and tie round the neck after making two holes for the arms to go through.

For the cloak, take a piece of red paper longer than the one used for the dress, but this time it must meet in front without being joined. Leave a long piece above the head, and tie it with cotton round the neck, as shown in picture 2. The piece left above the head is for the hood of Little Red Riding-Hood. Round off the corners with a pair of scissors, and gather the fullness by carefully running a thread all round the hood. This must be done very carefully to avoid tearing the paper. If you prefer it, a piece of very narrow baby-ribbon can be threaded through from each side, and tied on the top in a neat little bow. A piece of the same ribbon should be tied round the neck and finished in a bow to hide the cotton which keeps the paper in place.

Our first paper doll is now complete, and in picture 3 she certainly looks charming.

Now let us give Red Riding-Hood a sister in cardboard. This can be made quite easily. Place a

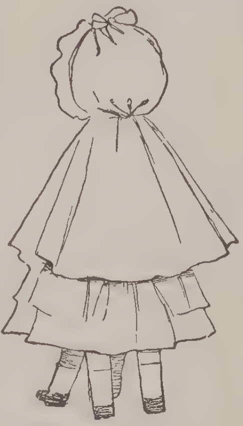
3. The finished paper doll.



4. Pattern of cardboard doll.

piece of thin paper over picture 4, and trace the outline. Then lay the paper over a piece of cardboard, and by going over the drawing with a sharp pencil you will make a mark on the cardboard by which you can cut the doll out.

When you have traced and cut *two* pieces exactly alike, stick the two heads and bodies together, leaving the legs loose, so that they may be bent apart to form a support. You will find that the doll then stands all by itself. The next picture, 5, shows this. If you have a box of paints now is the time for you to use them. Paint the face in a pretty pink shade and try to shade it so as to give the doll nice rosy cheeks, blue eyes, red lips and dark hair. The dress should be a very pretty green color, and the cloak, of course, must be of bright red. Paint the stockings red and the shoes black. When finished she should look like Red Riding-Hood in picture 7.



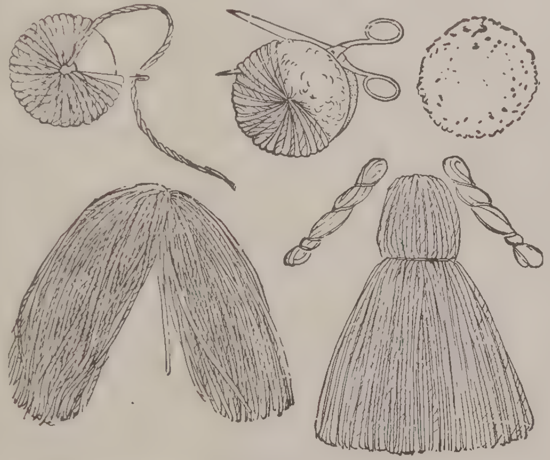
5. How the doll stands up.

She has a little woolen sister, who is a dainty little person. To make the body, take half an ordinary skein of white Berlin wool, cut in a bunch of about 18 inches long. Then tie it tightly in the middle—picture 6 shows you how. Fold the wool over and tie again just under the first knot to form the waist line, as in the picture. This is the first part of our wool doll and the hardest part.

7. The finished cardboard doll.

The arms are made by twisting a long piece of wool round and round until it forms a cord. When two of these are done, cut one end of each into a tassel for the hands, sewing the other end on to the top part of the body.

The head is the most interesting part to make. Picture 6 shows you the best way to do it — in the shape of a ball. For this you must take two round pieces of cardboard as big as a silver dollar, put them quite close together, and make a round hole as big as a quarter, through the centre. Through this you must wind round and round as much wool as you can get on the cardboard. Put the point of the scissors between the two cardboards, and cut the wool evenly all round. The picture shows exactly how this should be done. Then wind a piece of thread round the wool *between* the pieces of cardboard, and tie it firmly, in the middle. Take away the cardboards and shape the wool, and you will have a round, tight ball.



6. Making the head, arms and body of the wool doll.

Mark the eyelashes on the ball with black silk, the nose and mouth with red silk, and the eyes with blue silk. For the eyes blue beads are a great success.

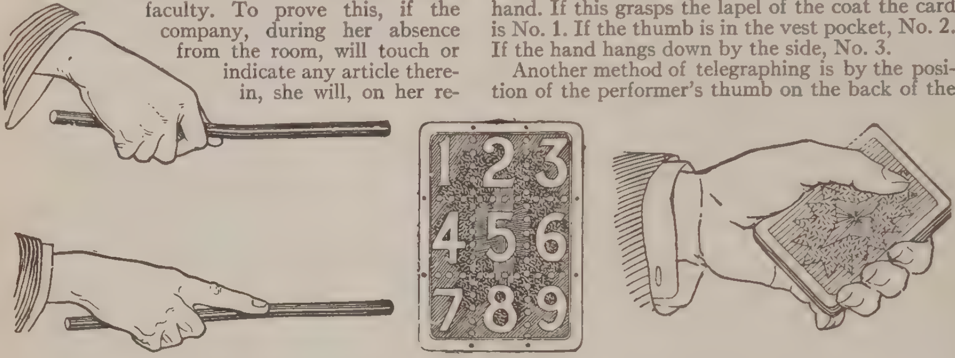
To complete the doll, tie round the waist a sash of satin ribbon, and make a red cloak and hood. These can be as fancy as you please.

8. Red Riding-Hood wool doll.

THE MYSTERY OF TELEGRAPHING THOUGHT

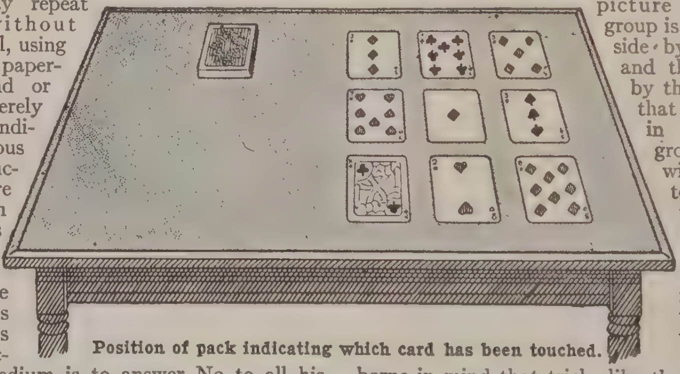
WE have all been baffled at times by the wonderful way in which a lady sitting on a platform at one end of a hall has been able to tell what a gentleman at the other end has in his hand, and this strange system of "thought-reading" is really very simple. The boy or girl who would learn to play this magical duet must practice diligently till each is perfect in the part they have to play—that is all.

Let us suppose that the duet is played by a boy and his sister. When the eventful night comes, the boy introduces the lady as his "medium." Being a medium, she naturally possesses a certain amount of the thought-reading faculty. To prove this, if the company, during her absence from the room, will touch or indicate any article therein, she will, on her return, declare which article it was. There are several ways by which the performer may impart the necessary information. One of the simplest is to arrange that when he asks for, say, the sixth time "Is it this?" the question is to be answered Yes. For a second attempt it may be arranged that the eighth or ninth question shall furnish the clue.



The methods of telegraphing thought with a magic wand and a pack of cards.

Another plan is to agree that whenever the performer's question refers to a four-legged object, say, a chair or a table, the one next following shall be answered in the affirmative. The performer may repeat the trick without speaking at all, using a ruler or paper-knife as wand or pointer, merely touching or indicating various objects in succession. Where he points with a "wand," as above, it may be agreed that, so long as the performer holds the wand as shown in picture 1, the medium is to answer No to all his questions; but if the forefinger is shifted so as to lie along the wand as in picture 2, the answer is to be Yes. The same principle may be carried a good deal further, as in the following capital trick. During the absence of the medium a pack of cards is first well shuffled; a great point should be made of this, because it has nothing whatever to do with the trick. Nine cards are then dealt face upward on the table in rows of three each. One of these is "touched" by one of the company. The medium, on her return, after a little cogitation, names the card.



Position of pack indicating which card has been touched.

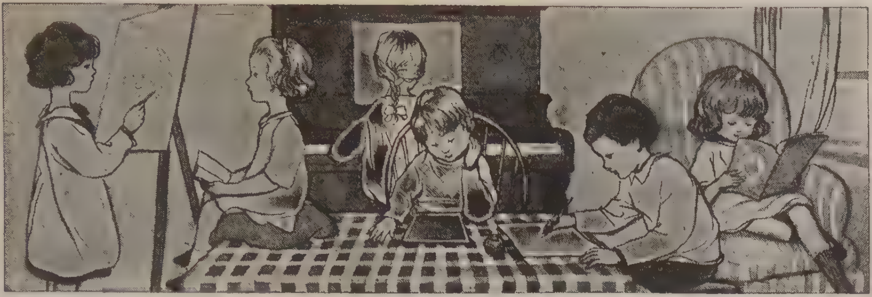
Here the row in which the card stands is indicated by the manner in which the performer holds the wand. If between the forefinger and thumb only, the card is in the first row; if encircled by two fingers, the second; if grasped by the whole hand, in the third. The number at which it stands in the row is revealed by the position of the left hand. If this grasps the lapel of the coat the card is No. 1. If the thumb is in the vest pocket, No. 2. If the hand hangs down by the side, No. 3.

Another method of telegraphing is by the position of the performer's thumb on the back of the unused cards. For this purpose you must imagine the surface of the top card as divided into nine portions, numbered as indicated in picture 3. The performer indicates the card touched by holding the pack so that his thumb shall rest on that part answering to it in position. Supposing it held as shown in picture 4, the medium would know that the card was the middle one in the first row. The trick may be repeated in a still more surprising way.

Suppose the nine cards laid on the table as in picture 5. A similar group is imagined lying side by side with it, and the pack is left by the performer in that position which in the imaginary group corresponds with the card touched. Thus the pack laid as in picture 5 would indicate that the middle card in the top row is the one.

It is to be borne in mind that tricks like these can be done well only when the two performers understand each other thoroughly. If signals are not caught the "medium" will have to guess more or less. So practice well before trying these in public.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 617.



MORE WORTHWHILE GAMES

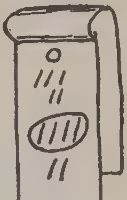
CONTINUED FROM 351

YOU can bounce a ball of course. How well can you catch it? Let's see how long it will be before you can catch it every time. First, let's make a little book to keep our scores in.

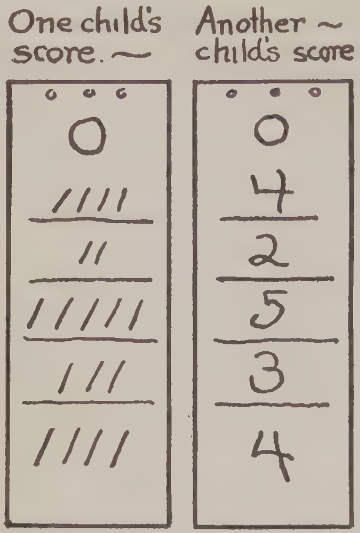
Make your score book long and narrow like the picture. Take some paper as big as this page or even bigger. Fold it in the middle and cut it on the fold. Put all the pages together and punch holes in the top. Put a string through the holes and tie it.

On the first page put your name. Ask mother to write it for you. On the top of the next page draw a picture of a ball, and here is where you will keep your ball scores.

BOUNCE your ball five times. See how many times you can catch it. That is your score. Put down that number of marks in a row like this—|||. Bounce again five times. Put down your score as before. When you stop playing, be sure to draw a big ring around your best score as in this picture.



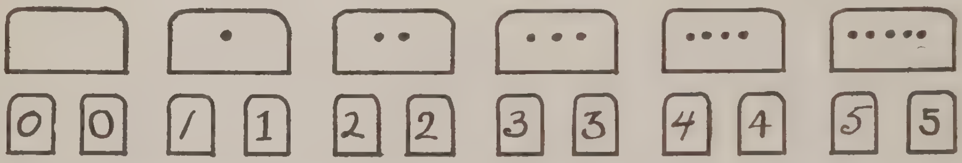
Copyright, 1926, by Ethel B. Waring.



NOW you know just how well you can catch and bounce a ball. Your score tells you. Next time you play, see if you can do better. If you practice you will soon have a page of Just Right scores.

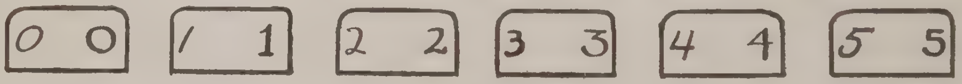
BIG boys and girls keep score in almost all of their games. They use digits to tell the numbers. These are digits: 1 2 3 4 5. And these are digits too: 1 2 3 4 5. Perhaps you know these digits and what each one means. If you don't know them Just Right, you can make this number game to help you learn them.

Make the long cards this long ————|————|————|————| and this wide ————|————|. They have stickers* on them.



How many stickers are there on the first one? Not any. And this is the digit that says "not any," 0. Its name is zero. The next card has one sticker, the next two stickers, and so on. Make all the stickers the same color for the whole game.

This is the way the big cards look when you turn them over.



Be sure to put the digit on the back of each card which has just that number of stickers on it. Then make your little cards.

The little cards are this wide |————————| and they are this tall |————————|. They have nothing on the back. The digits needed are on the top of page 2, Work Book.

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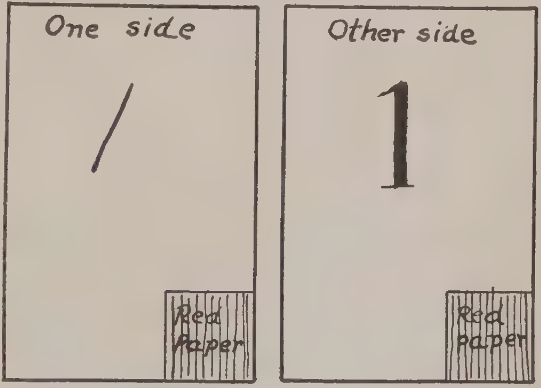
*Smallest-size lawyer's seals serve well—in red, blue or green. They can be had at stationery stores.

Cut the top corners of your cards a little round, so you will be sure to hold the cards right side up when you read the digits. Ask mother for an envelope to keep them in when you are not playing.

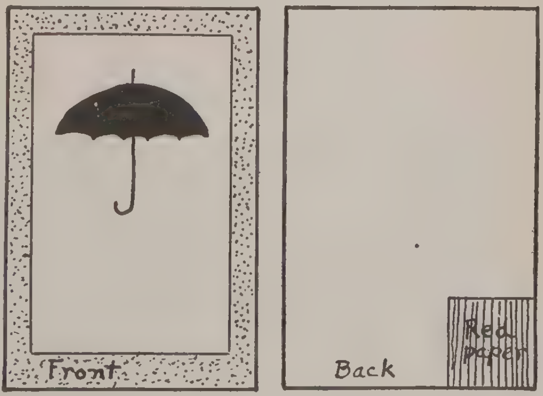
I WILL show you one way to play, if you play all by yourself. Lay the cards out in a row. Have the stickers on top. Put each little card under the big one that you think says the same number. When you have put them all down, turn over the big cards. If the digits on the little cards are just like those on the big cards, they are right. If not, take them away. Count up the number you have right. That is your score. Put down that number of marks in your score book.

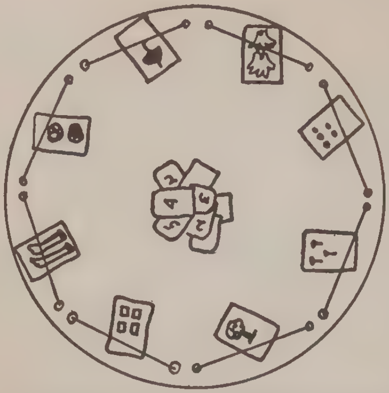
To remember which game the scores on this page of your score book belong to, you can put a sticker at the top of the page. When you stop for to-day, draw a ring around your best score. When someone comes to play with you, you can divide the cards so each of you has some, and take turns; first show your friend how to play, then you take a turn, then give your friend another turn, and so on.



Or you can put the big cards in a pile between you. Can your playmate find a digit that says the same number as the stickers on the top card? Turn it over and see. If he is right, he scores. Then it is your turn.

DO you remember the first number game you made? It was about one hat and one umbrella, two gloves and two shoes, and so on. You can make a digit game out of it with the digits on the bottom of page 2 of the Work Book.

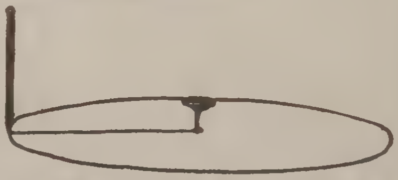




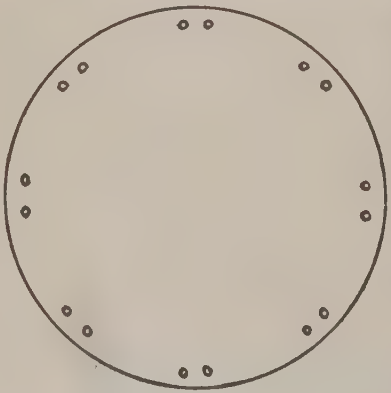
Cut five cards more the same size as the umbrella card. On one of them put a "/" on one side and a "1" on the other side. On both sides put a square of the same color you put on the umbrella and hat cards.

Fix your "two" cards with the digits that say the same number as the gloves and the shoes. Then fix cards with the digits and color squares which match the three balls and three books, the four boats and four cars, and the five tops and five pennies. In the picture the cards are on a big wheel.

Make a big wheel like this. You can use beaver board, heavy cardboard, linoleum, or a piece of an old window shade. Any material that is strong and stiff makes a good wheel game.



To make a round circle take a string. Tie it around your pencil. Find the middle of your material, and put a mark there. Make your string reach from the middle to the edge. Tie a knot in the string there. Put a tack through the string at the knot and push it into the mark you made in the centre of your material. The picture shows you how. Then move your pencil around. You have made a circle. Cut around this line you drew, and you have the wheel for your game.



Now make some marks around the edge of your circle. The long spaces are about as long as this page. The short spaces are about as long as this: |————————|. Punch holes where the marks are. Put some elastic cord through the holes so it looks like the picture at the top of this page. Tie the elastic underneath.

Put the digit cards you have just made in a pile in the centre. Let Mary pull a digit card out of the pile. You find the picture that says the same number. Look on the other side and see if your card has the same color on it as Mary's. You remember you put the same color on all the cards that said the same number. So now you can tell if you match Just Right in your game. You keep every card you match right. At the end of the game each of you count your cards. How many have you? That is your score in this game.

WHAT HAVE YOU LEARNED?

Just how well can you bounce and catch your ball?

Have you ever had a Just Right turn in bouncing ball?

Have you ever had a Just Right page in your score book?

Do you know how many these digits say:

1 3 0 5 2 4 ?

and these: *1 3 0 5 2 4*?

Can you make your own score book?

Can you keep your own score?

Can you help mother make the games she reads about?

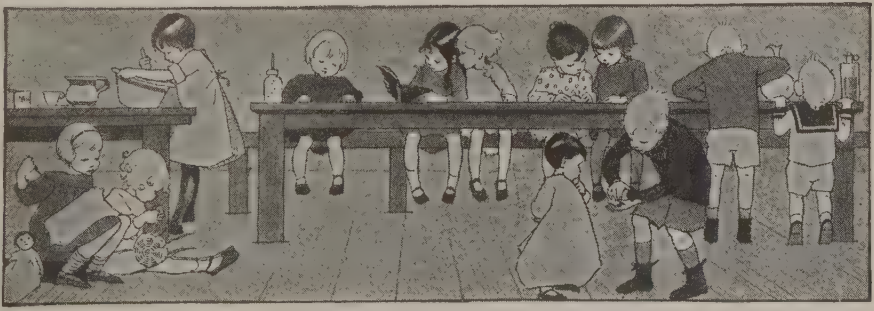
Can you play games Just Right with the other children? That means, Can you take turns Just Right?

Can you follow the rules Just Right?

Can you help the other children when it is their turn to lead?

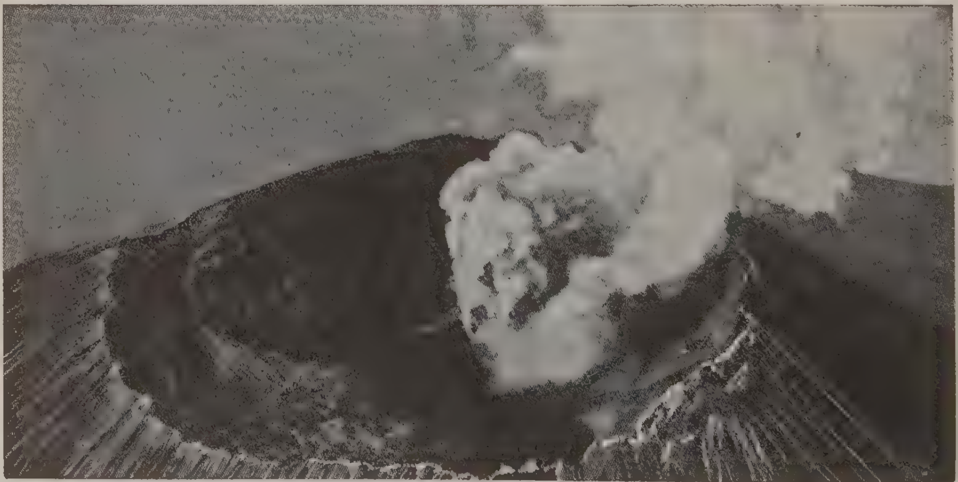
Can you be a leader when it is your turn to lead?

Can you make up any new games to play with your cards and your wheel?



THE NEXT HELPS TO LEARNING ARE ON PAGE 1017.

Europe's great volcano—Vesuvius, which destroyed Pompeii and is still active.



Vesuvius seen in action from an airplane.

Molten lava from the earth's interior pours forth from the crater of Kilauea.

HOW FIRE AND WATER MADE THE WORLD

CONTINUED FROM 389

The hills are shadows, and they flow
From form to form and nothing stands;
They melt like mist, the solid lands,
Like clouds they shape themselves and go.

WE have seen that the earth blossomed, as it were, from the sun, and grew into a huge hot ball denser than steel, with a wonderful substance called radium in its crust to keep it warm.

Many people think that when it first hardened it was probably pear-shaped, and even to-day, if we were to remove the seas, the earth would roughly resemble a pear or peg-top; at least it would have a bigger rounded end at the North Pole and a smaller more pointed end at the South Pole. But the early pear-shaped earth had still to go through much smelting and forging.

When ore is melted in a furnace the stony materials rise to the top, forming slag such as we see heaped round iron foundries, and the metals collect in the lower part of the furnace. In the mighty fiery furnace of the blazing earth the same sort of separation occurred, so that it grew to have a core of iron and other heavy metals surrounded by a crust of slag. Nobody has ever dug right through the slag, now in the form of mud-rock, to the metal core, but it is believed to be from thirty to fifty miles thick. Indeed some geologists think that between the solid slag-mud and the metal cone there is a layer of molten slag which has not yet solidified.

The slag consisted chiefly of two beautiful rocks—granite and basalt; and it is these two rocks that have made the earth the home of life. If the earth had been composed wholly of metal, it would have made a giant cannon-ball; but it could never have become a world of living things. The granite and the basalt slag contained iron, magnesium, silicon, phosphorus, lime, sodium and potassium; indeed, all the elements necessary for life—even water and the gases carbon dioxid and nitrogen. That is surely a marvelous thing—that the stuff of the whirling fiery furnace of the earth should have contained *exactly the things necessary for life!*

But granite and basalt are hard rocks; and Life at that stage might have complained: "I asked for bread, and you give me a stone." In that stage the crust was not even a crust of bread. Yet the elements of life were there; the rocks had been made, and now they had only to be ground down into soil. So the great mills of God began to grind; and

Though the mills of God grind slowly,
Yet they grind exceeding small.

They ground the granite and the basalt into mud and dust.

As the hot slag cooled down, it contracted and puckered up into mountain ranges, or was torn asunder, leaving great cracks through which poured rivers and seas of steam and lava; and everywhere volcanoes flung hot ashes and gases to the sky, and filled the heavens with dust and clouds. Probably the gas from the torn and twisted crust grew to be the atmosphere, and almost certainly the steam from earthquake cracks and volcanoes grew to be the water of the world. The steam condensed on the top of high mountains and became rivers and seas; and the air and the water began their great work of wearing down the granite and basalt mountains.

Millions of years they worked away, while the volcanoes steamed and the earthquakes thundered, and the tortured crust was twisted and torn; and during these years of mountain-making and rock-grinding the whole geography of the crust was ever changing, so that great mountain ranges rose out of the sea and the floors of seas became dry land.

MOUNT EVEREST RISES FROM THE WHALES AND VISITS THE EAGLES

At one time the Himalaya Mountains were at the bottom of the sea, and were slowly lifted out of it—"once with the whales, now with the eagle skies"—and at one time there was almost certainly a great continent in the middle of the Atlantic Ocean. Some of the rocks and mountains of the world are composed almost entirely of sea-shells, great and small. "The white cliffs of Dover" are built up of such shells which collected on an ocean floor, and some of the limestone rock in the state of New York contains as many as 40,000 tiny shells in each cubic inch. And all this lime had been worn off granite and basalt mountains by rain, washed into the sea, and collected by the little living creatures there! The Dolomites in the Tyrol are actually made of coral, that is to say, of lime and magnesium collected from the sea by coral-making creatures, and originally basalt slag and granite slag worn down by rain and rivers. Well did Tennyson write:

There rolls the deep where grew the tree.
O Earth, what changes hast thou seen!
There where the long street roars hath been
The stillness of the central sea.

Yes, not so very long ago, as we count time in geology, Regent Street, Broadway and Dufferin Terrace were deep under salt water; and only in a few little areas in the British Isles are there any bits of rock that have not at one time been mud in the bottom of the sea.

It is extremely difficult to know how land and sea were arranged ages ago, but it is quite certain that there have been tremendous changes. At one time, as we said, the Himalayas and the Dolomites were at the bottom of the sea, and that is the history also of the Alps and of the Alleghanies.

THE VOLCANOES THAT BURST THROUGH THE NEW CHALK FLOOR OF BRITAIN

Not only is there reason to believe that at one time there was a continent in the middle of the Atlantic; but it seems likely that once we could have walked overland all the way from where New York is to where Australia is, and could have gone by boat all the way from where Stockholm is to where Peking is. Anyway, it is certain that only after tremendous changes—heavings, sinkings, crumplings, crackings—did the earth reach its present form.

Even after the seas were formed, we find evidences of tremendous eruptions. At one time, when Ireland and Britain had been raised from the sea as one great island of chalk, a tremendous volcano—or, it may be, several volcanoes—burst through its white floor and covered many thousand miles of the white chalk with molten lava a thousand feet deep. The remains of this lava outflow are still to be seen in the massive basalt columns of the Giant's Causeway, and at some time there must have been a basalt causeway all the way between Ireland and Scotland. But a still greater lava outflow took place in Iceland, coming forth like a deluge from a colossal crack, covering fifty thousand square miles, ten thousand feet deep, and uniting Iceland with the Faroe Islands, the Hebrides, Ireland and Scotland in one huge island.

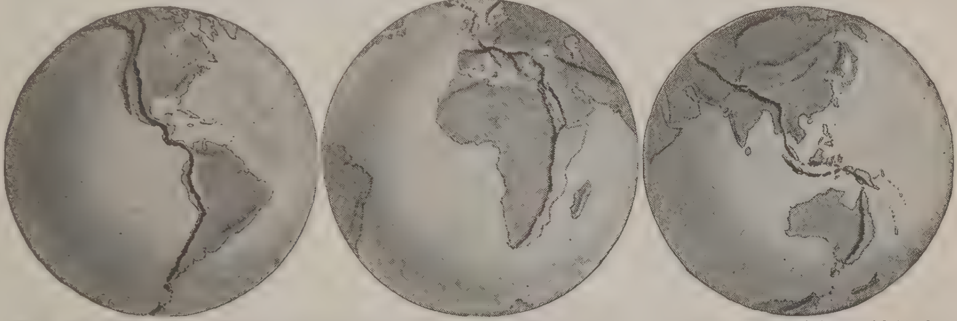
THE MILLS OF GOD GRIND ON, AND THE RIVERS WASH AWAY THE EARTH

In later years, when the earth's crust was harder and more stable, such tremendous eruptions did not occur; and the changes on its surface were less violent; but changes continued; fire, water, frost, wind, glacier and animal life all worked unceasingly, shaping and reshaping the surface of the world.

As we now know it, earth seems a finished planet. It has mountains and seas, and rivers and forests. Its granite and basalt have been ground down into soil for roses and trees and wheat, and it is teeming with plant and animal life. The furnace has wrought it into perhaps the most wonderful orb in the universe. But still the mills of God grind on. Still the rain and the rivers are ceaselessly washing the world into the sea. Still we can hear

> The sound of streams that fast or slow
> Draw down Æonian hills and sow
> The dust of continents to be.

Still the waves are nibbling and gnawing at the coasts of islands and capes. Still the wind is wearing sandstone hills into sandy deserts. Still chalk cliffs and coral peaks and continents may be slowly rising from the depth of some ocean; even still some volcano yet unborn may overtop Chimborazo and Aconcagua.



THE MOUNTAIN RANGES FORMED BY THE CRUMPLING UP OF THE EARTH AS IT COOLED

The ranges shown in these pictures were all formed by the wrinkling and folding of the earth's crust; and they are formed mainly of mud accumulated at the bottom of the sea, though in many cases—as in the case of the Andes—volcanoes broke through the folds and increased the height of the general ranges.

Once more the Mississippi Valley may be submerged: once more men may walk dry-foot across the Atlantic. We live only a short time, and the mills of God grind on so slowly that in a human lifetime little change is to be seen on the face of the earth; but even in one lifetime we can watch the mountains "flow from form to form"; and the gradual sinking or rising of parts of the earth's surface, the slow nibbling of the coasts by the breaking waves. Within the last fifty years several volcanoes have been blown to pieces, and great earthquakes have occurred which have made new cracks in the earth's slaggy crust. Our earth is not yet dead; it has still a hot heart; and so long as there are water and wind, and a sun to move them, it will go on changing. Some day, millions of years ahead, when the sun is extinct, our planet may spin as a cold, dead ball covered with frozen air; but unless something unforeseen happens, it has still a changeful life before it for millions of years to come.

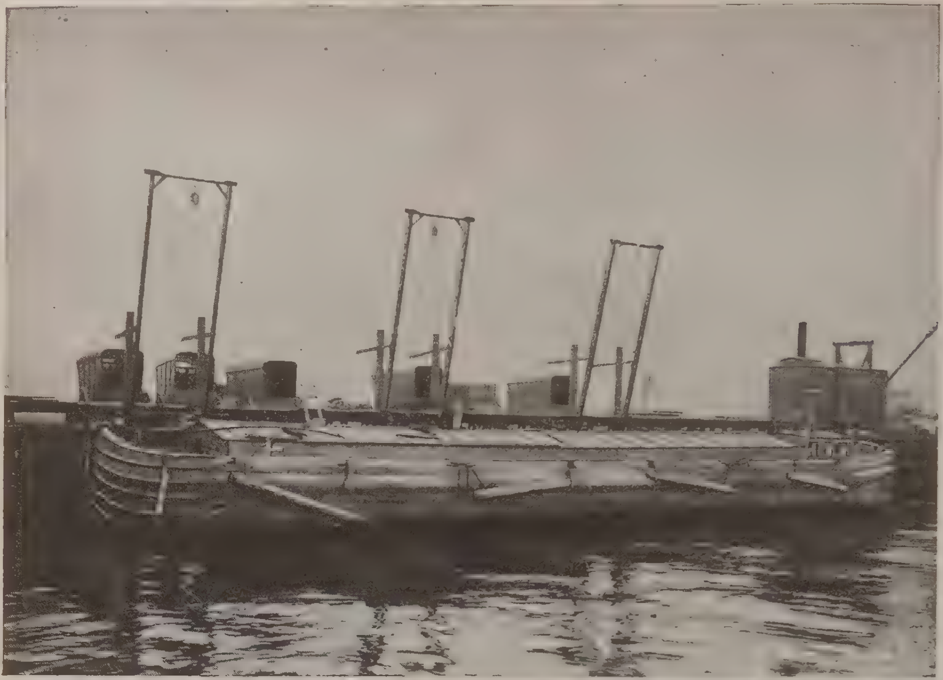
To what great goal all these changes are working we cannot tell; we cannot see far enough. But as we spin through space we can study the changes and take interest in them, knowing that they are directed by the same far-seeing Wisdom that melted the world in a furnace, and brought forth the magic slag which grew into the wonderful world of plants and animals.

It may seem to us that the earth could not be much better than it is: we and the plants have just the right gases—oxygen and carbon dioxid—which we need for life. With less oxygen and more carbon dioxid we could not flourish so well, and might die. The plants, too, have just the right food in air and water to make food for themselves and for us. We even find coal ready for our use prepared by the sunbeams and forests millions of years ago; and we find iron and salt and other useful elements all collected together in places. Beauty, too, we find everywhere —flowers and trees and blue skies, and rivers and seas and mountains.

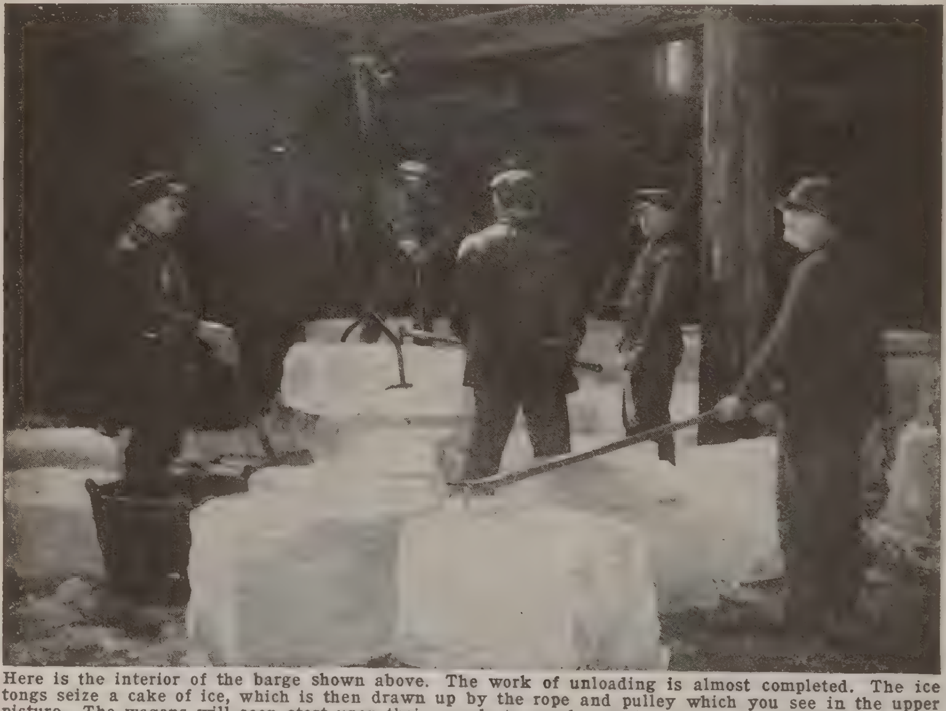
Altogether it seems a very perfect and wonderful world, with all things fitting like the wheels of a watch, and we may find it difficult to believe that further change will bring forth yet more wondrous things. But all the changes through all the past, spread over millions of years, have led upward and onward. The beautiful blazing earth cooled down till its outside was slag and mud and dust; but it died to live again, and we can believe that the future holds beauty and wonder.

THE NEXT STORY OF THE EARTH IS ON PAGE 629.

BRINGING ICE TO THE HOT CITY



As ice is needed in the city one of the houses is opened and its contents are loaded into clumsy barges, several of which are then towed down the river by a tugboat. The barge shown in the picture is lying beside the pier in the city, and is being unloaded into the wagons which you see on the pier above. A string of these barges drawn by a saucy little tug is an interesting sight.



Here is the interior of the barge shown above. The work of unloading is almost completed. The ice tongs seize a cake of ice, which is then drawn up by the rope and pulley which you see in the upper picture. The wagons will soon start upon their rounds to supply regular customers. To each wagon is assigned a certain district, which it visits every day with its refreshing load.

Marking lines on the ice before beginning work, so that it may be cut evenly.

HOW WE GET OUR ICE

CONTINUED FROM 420

HAVE you ever stopped to think what difference ice makes in our comfort and in our health? In the ice-box the butter is hard, the milk sweet and cool, the lettuce crisp and tender, the dessert firm, and the meat for the next dinner does not spoil. Then, too, there are ice cream, soda water and lemonade, and perhaps some of you are allowed to have iced tea. When you go to market with your mother, you see the butcher bring out the meat from an ice-box as large as a room, perhaps, and you see the fish lying on ice. You have read that the meat and the fish are brought to market in cars which are themselves ice-boxes. We take all this as a matter of course, without thinking about where the ice came from. Perhaps it is a part of the covering of the pond or river over which you skated last winter. Perhaps it was frozen last week in the building you can see on the hill, or else it was brought to your town in boats or railway cars.

If you live in the country or in a little town in Canada or the northern part of the United States, perhaps you have seen men cutting ice and storing it in small ice-houses during the winter for use during the summer; but the ice for a great city can seldom be gathered so easily, for there is not always near by a body of pure water large enough to furnish a sufficient quantity of ice. So the city must bring its ice from a distance or else manufacture it, or perhaps both natural and artificial ice are used. Since New York uses more ice than any other city in the world, we shall show you the methods by which the millions of people who live there are supplied.

There is no large body of pure water near the city, for the Hudson, when it passes by the city into the sea, has been soiled by the filth poured into it along its course. Further, it is salty, for the tides move up many, many miles. A third reason is that the river is very seldom frozen in the lower part of its course.

In the upper part, however, where it is shallow and sometimes spreads out over the fields, it freezes, unless the winter is unusually mild, and the water is much purer than it is lower down. From these broad stretches the greater part of the natural ice used in New York City comes. Hundreds of men and horses, dozens of houses, and scores of boats are required to gather, store and deliver this crop.

Now let us begin at the beginning. When the really cold days come, and the mercury drops far below the freezing-point and remains there, the crop begins to form. One or two cold days are not enough, especially if they come suddenly, for the earth is warm and the water also. Then, too, the current has some effect in preventing ice from forming.

HOW THICK MUST THE ICE BE BEFORE CUTTING?

Ice thick enough to allow skating with perfect safety may be entirely too thin to be cut and stored, for anything less than twelve inches thick cannot be stored profitably, and the icemen prefer to have it even thicker. Very cold weather, continuing for several days, is required to produce ice twelve inches thick.

Sawing the ice apart after it has been marked into squares by the marker shown on another page.

Let us suppose that the temperature has been low for several days, or even for weeks, and that ice thick enough for cutting has formed. Clear cold weather without snow is preferred, for snow forms a protecting blanket and hinders the freezing of the water beneath by preventing the heat of the water from escaping.

If snow has fallen upon the thick ice, it must be removed, and this is done by scrapers. Then follows the marker, which is shown at the beginning of this article. It cuts grooves in the ice about three feet apart as the horse marches up and down the field. Then the horse and man turn and cut lines perpendicular to those already made, and the field takes the appearance of a great checker board with squares three feet on a side. Plows follow and cut the grooves deeper.

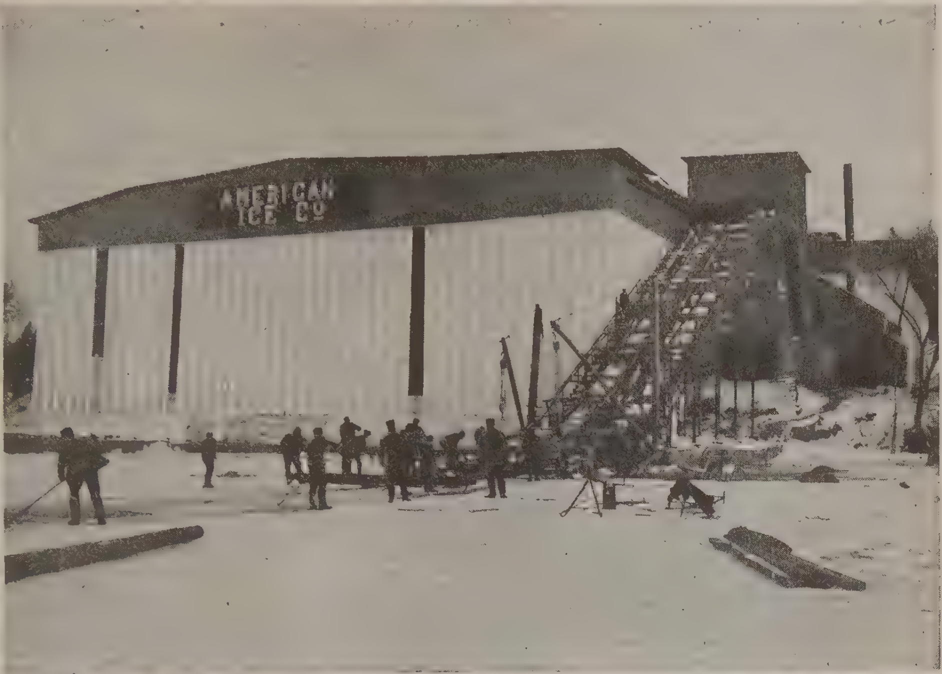
Some of these squares are then separated by means of saws and crowbars, and either are floated through a lane of open water to the ice-house or else are loaded on sledges and drawn to the house. If you look at one of our pictures you will see an inclined scaffold reaching from the water's edge to a door near the top of the house. On this scaffolding runs an endless chain, or belt, with projections every few feet. The cakes of ice are slipped upon this, and as the belt moves they are drawn up to the door and pushed inside. At the bottom of the same page is a view of the interior of the house, which is solidly packed with ice, except for the sawdust which fills the crevices between the cakes. When the house is filled, it is closed, and the men move on to another, for there are dozens of these houses along the banks.

HOW THE ICE COMES TO TOWN WHEN NEEDED

When this ice is needed in the city it is loaded in barges, as the clumsy boats shown in the picture on another page are called, and several of them are drawn by a tugboat down the river to the wharves, where their precious cargo is loaded into wagons and taken to a storage house near the wharves, or is brought directly to your door by the heavy ice-wagon.

Most cities and towns which have cold winters use chiefly natural ice, but many of these have ice factories which furnish a part of the supply. In climates where

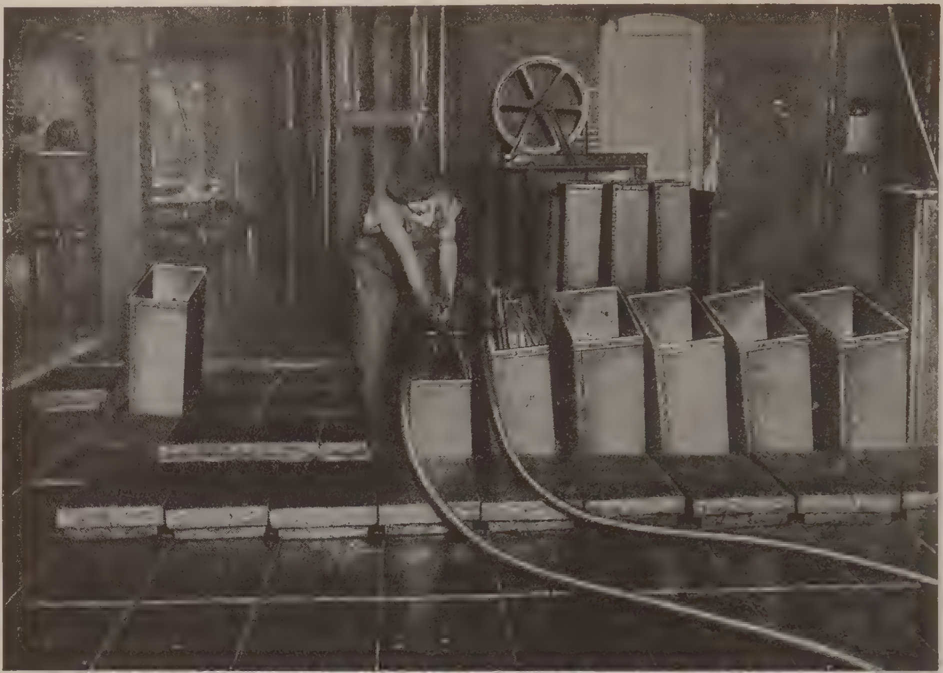
PACKING AWAY ICE FOR SUMMER DAYS



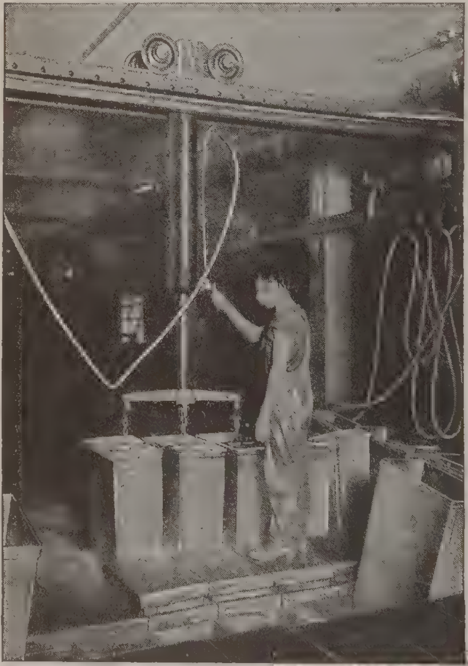
Men are floating the cakes of ice, each about three feet square, through the lane of open water to the foot of the inclined framework. Over this scaffold endless chains, or belts, are kept moving. Projections on these belts keep the cakes from slipping backward, and they are carried to the top of the little tower, and then pushed off into the house, where other men pack them closely together.

Here is the interior of the house above. As the cakes of ice slide in they are packed closely together, so that the men you see are standing upon a floor made of blocks of ice. Other layers will be added until the house is full, after which it will be closed and the men will move to another house. When full, one of these houses is almost a mass of ice inclosed by walls of wood and sawdust.

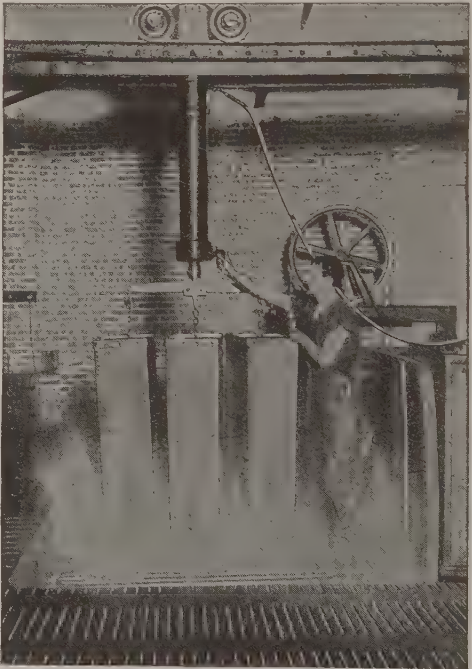
HOW ARTIFICIAL ICE IS MADE



Here is the interior of an artificial-ice plant. The floor is made in sections, so that a part can be lifted without disturbing the rest. Underneath is a great tank of brine through which a network of pipes carrying ammonia runs. The man is filling the rectangular boxes, called "cans," with distilled water. When full, they are covered tightly and let down into the cold brine.

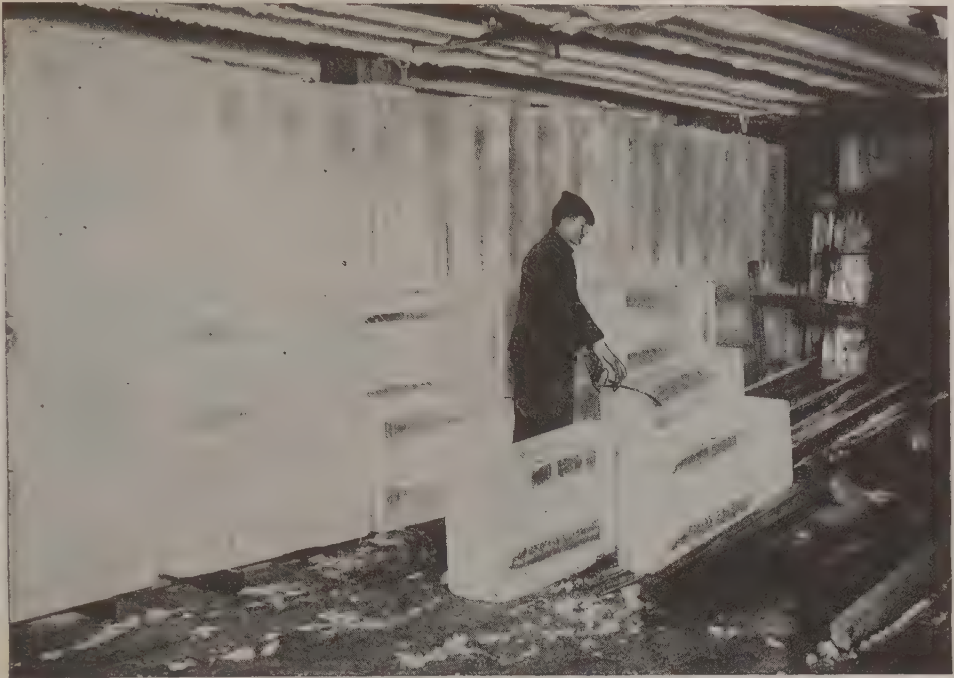


These cans have been in their briny bath for forty-eight hours, and their contents are frozen. By means of a crane three cans at a time are drawn from the brine-tank below.

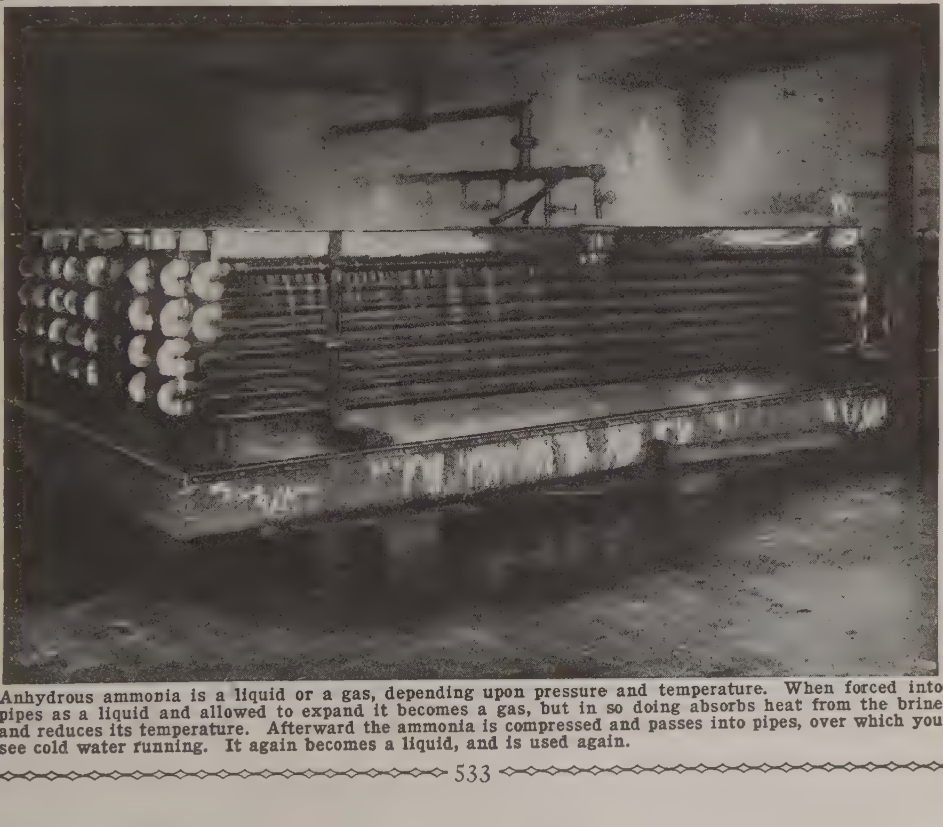


The ice, however, is frozen to the cans and refuses to come out. Therefore they are swung along and lowered for a moment into a tank of hot water, and the ice slips out easily.

OTHER VIEWS OF AN ICE PLANT



The cakes, weighing about 300 pounds each, are shoved through a trap-door into this room. Artificial ice is not so solid as natural ice, and the storeroom must be artificially cooled. Natural ice freezes from the top, and the air bubbles are forced out. In the cans the cold is applied from all sides and the air bubbles go to the centre, forming a milky streak which is sometimes not very well frozen.



Anhydrous ammonia is a liquid or a gas, depending upon pressure and temperature. When forced into pipes as a liquid and allowed to expand it becomes a gas, but in so doing absorbs heat from the brine and reduces its temperature. Afterward the ammonia is compressed and passes into pipes, over which you see cold water running. It again becomes a liquid, and is used again.

thick ice does not form in winter the need must be supplied by bringing natural ice to them, which is expensive because of the freight charges and the waste; or else artificial ice must be manufactured.

In the days before men learned how to make ice, large cargoes were often shipped to southern ports, but the waste was so great that ice was very expensive in southern towns. Now ice is almost as cheap in the South as in more northern regions. Let us see how this can be. If you read carefully you will understand, for it is really very simple.

THE MYSTERY OF MAKING ICE IN HOT WEATHER

When a substance changes from solid to liquid, or from liquid to gas, it absorbs much heat. If you have ever spilled alcohol on your hand, or have had your mother bathe your aching forehead with camphor (which is simply solid camphor dissolved in alcohol), you will understand this. As the alcohol evaporates—that is, changes to gas—it takes the heat from your skin and makes it feel cooler. Ether will make it still cooler.

There are a number of substances which, while they are liquids under pressure, will change to gases at low temperatures if the pressure is removed. One of the cheapest of these is called anhydrous ammonia, which will boil—that is, change to a gas—at a very low temperature, if placed in an open vessel. Under heavy pressure it becomes a liquid but struggles to resume its gaseous form.

Here is the secret of ice-making. The ammonia is allowed to pass slowly into pipes where it has room to expand into a gas. These pipes pass through a great tank of brine. In changing to a gas the ammonia absorbs the heat from the brine and makes it very cold. The brine does not freeze, however, as salt water does not freeze so easily as fresh water. But if cans of fresh water are placed in the brine, the heat will be taken from them, and in about forty-eight hours the water in a can 40 inches long, 22 inches wide and 11 inches thick (which is a common size) will become a cake of solid ice weighing about three hundred pounds. Perhaps you have seen flowers or fruit frozen in one of these.

Here is a corner of a cold-storage warehouse, where meat, poultry, butter and eggs are kept. Cold hinders decay, that is, the growth of microbes. Therefore meat, eggs and other things may be kept in cold storage for months and still be fit for food.

All photographs in this article from Brown Bros.

HOW THE ICE-MACHINE WORKS DAY AND NIGHT

When the contents are solid, the cans are drawn out of the brine and are dipped into hot water for a few seconds so that the ice will slip out easily when the cover is taken off. Then they are again filled with water and replaced in the brine to make more ice.

Another form of ice-machine freezes the ice in the form of slabs, or plates. Hollow metal boxes containing brine and ammonia-pipes are set in a large tank of pure water. The ice freezes on the sides of the boxes. When it is thick enough, warm brine is pumped into the boxes, the plates of ice slip off into the water and are taken out and sawed to the proper size.

MAKING THE AMMONIA DO ITS WORK OVER AGAIN

The ammonia gas, after it has passed through the pipes in the tank of brine, is again compressed, and becomes very hot in the process. If the compressed ammonia can be reduced to a temperature of 80° it will again become a liquid. So the pipes full of the compressed ammonia are arranged so that cool water runs over them, and the ammonia again becomes a liquid which can be used again. So the process goes on day and night.

You have heard and read much of the danger of drinking impure water, but it is a common belief that water is purified in freezing. This is only half true. Much of the dirt in the water of a pond or river is forced out in the process of freezing, and some things which would cause disease, if drunk in water, are destroyed by freezing, but some of the most harmful germs seem to be able to live a long time in ice. Ice is always purer than the water from which it was made, but dangerous water makes dangerous ice. Unless you are quite sure of the purity of your ice it should never be put into the water you drink.

In making artificial ice the water is shut up in the can, and cannot force out impurities while freezing, as natural ice does. So if it is made from bad water, it is more dangerous than natural ice made from the same water. Most artificial ice plants, however, use distilled water, and ice made from it is, of course, purer than any natural ice, if dirt is not allowed to get into the cans.

WHAT ARE COLD-STORAGE WAREHOUSES?

You have heard of cold-storage warehouses, and perhaps know that fruits, vegetables, meat, fish, eggs and other foods are kept in them sometimes for months. The plan is very simple. A house is built with walls so made that they are poor conductors of heat, and the heavy doors must fit very tightly. The rooms may be cooled in different ways. Sometimes brine is cooled in the way you have been told, and it is then pumped through pipes which pass through the storage rooms. The brine takes up the heat from the air, and after it has finished its journey, comes back to the tank, where it gives up its heat, and so makes the journey over and over again.

Sometimes the brine-pipes do not pass through the rooms, but are arranged in coils outside, and fans drive air cooled by passing over them into the storage rooms. In a few cases the ammonia-pipes pass through the rooms; but this is a great risk, for if a pipe should break or leak, the biting gas would spoil some kinds of food, besides harming any men who happened to be inside. Occasionally a cold-air system is used; that is, air is compressed and then allowed to expand as it passes through the rooms.

WHY COLD STORAGE IS A GOOD THING FOR US

Are cold-storage warehouses a good thing? Undoubtedly they are, though you may hear people talk against them. All kinds of food will not keep forever in them any more than in cans. No doubt, food is sometimes kept in them too long, and when it comes out is not so good as it ought to be. Dishonest men sometimes sell cold-storage food as fresh, but it is hard to see how people in the cities, at least, could get along without these storage warehouses. Some articles of food could not be had at all, and without them the prices of many other things would be much higher. Hens do not lay much in the winter time, and if eggs were not put away when they were cheap, the price in winter would be so high that only the wealthy could buy them. Then, too, not enough fresh meat could be brought regularly to our great cities, nor could we have many fruits except for a few weeks in the year.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 635.

THE FORTY THIEVES LEAVING THE MAGIC CAVE

Ali Baba, cutting wood in the forest, saw a band of forty thieves, and, hiding in a tree, saw the thieves enter the magic cave in which they hid their gold. Then the thieves came out again, and the cave closed up; but Ali Baba came down, called out "Open, Sesame!" as the thieves had done, and the doors opened.

Ali Baba in the days of his prosperity.

ALI BABA AND THE FORTY THIEVES

CONTINUED FROM 404

ALI BABA was a poor man who lived with his wife in a town in Persia, and one day he went into the forest to cut some firewood. He saw a band of forty thieves, and climbed into a tree and hid himself. The tree grew beside a great rock, and the forty thieves came to this rock and cried: "Open, Sesame!"

A door opened leading into a cave, and the forty thieves went in and placed there the gold and silver they had stolen. Then they came out and cried: "Shut, Sesame!"

Then the cave closed up, and they rode away. Ali Baba then came down from the tree and cried: "Open, Sesame!"

Again the cave opened, and he entered and found himself in a sort of treasure-house, stored with sacks of gold and silver; and, seeing that it had all been stolen, Ali Baba seized as many sacks as he could carry and took them home.

"Now," he said to his wife, "I will soon grow as rich as my brother Cassim."

Another thought pleased him very much, for his brother was a proud and haughty man, who had married a very wealthy woman.

"We must measure how much gold we've got," said Ali Baba's wife joyfully.

So she went to Cassim's house and asked for the loan of a measure. Cassim's wife wondered what sort of grain her poor sister-in-law had got. So she put some wax under the measure, and when the measure was returned to her she found, to her immense surprise, a piece of gold sticking to it. She at once told Cassim, and Cassim went to Ali Baba and asked him where he had got his gold from. Ali Baba frankly told his brother about the treasure-house in the rock, and told him how to open and shut the cave.

"I'll have all that gold carried away before Ali Baba gets a share of it," said Cassim to himself.

He at once took ten mules to the cave with the idea of loading them with all the sacks. He cried, "Open, Sesame!" and got into the cave, and danced with delight when he saw how much treasure there was. But at last he became so excited that when he wanted to take away the sacks he forgot the words that opened the cave.

"Open, barley!" he cried. "Open, wheat!"

While he was trying to think of the right word the forty thieves returned, found him in the cave and killed him.

The next day Ali Baba went to get some more gold, and he discovered in the cave the body of his brother, and carried it away and had it decently buried. Then, in accordance with Persian customs, he took his widowed sister-in-law to live with him; and with her came a clever female slave whose name was Morgiana.

When the forty thieves found that the body of Cassim had been removed from the cave, they were full of fear.

"So there's another man who knows our secret!" said the captain. "But I know how to find him."

He disguised himself and went to the town, and inquired if a man who had been slain by the sword had recently been buried; and he at last learned that just such a man had been buried by Ali Baba

"Now," said the captain of the thieves to his men, "I must arrange to get all of you quietly into the house of this Ali Baba; and you must come out at night and kill everybody there, and escape without being seen."

So he brought some of the huge leather jars in which the Persians used at that time to keep their oil, and he got a thief to get into each one of them, and covered them up, leaving a little space for air. He then put them all on some mules, and took with him one jar really filled with oil in case he should be called upon to show what he carried, and traveled at night from the forest into the town, and stopped before Ali Baba's house.

"I have brought my oil from a good distance," he said to Ali Baba, "and it is now too late to go to an inn. Will you kindly put me up for the night?"

Being a kind-hearted man, Ali Baba welcomed the captain of the forty thieves, and told the servants to look after the mules and bring in the jars Morgiana was sent to cook a supper for the strange guest. Finding that she had no oil to fry the meat in, she went to take a little out of one of the jars. When she approached, the thief thought she was the captain, and whispered:

"Is it time?"

"Not yet," said Morgiana.

She went from jar to jar, and found there was a thief in each, and at last she came to the jar which was filled with oil. She heated the oil in a great kettle, and then crept up to the jars and poured in the hot liquid, and scalded all the thieves to death.

"Now we'll see what will happen," said Morgiana.

At the dead of night the captain tried to arouse the thieves; but after peeping into the jars he saw that his men were all dead, and he rushed quickly out of the house In the morning Morgiana told Ali Baba the whole story, and Ali Baba buried the dead thieves secretly the next night.

"But remember," said Morgiana, "there is one thief still at large; and you must be on your guard, for he will never rest until he has killed all of us who know his secret."

Morgiana was right. For the captain of the forty thieves soon returned in a new disguise, and set up as a shopkeeper, and tried to make friends with Ali Baba and get an opportunity of killing him. One day Ali Baba invited him to come to supper. Now, there is a very strange law of honor which all Persians and other Mohammedans strictly observe. Even the very worst man among them will not kill anybody with whom he has eaten salt. So the captain of the thieves said to Ali Baba:

"I should be pleased to sup with you, my friend, but I must confess I have a very curious taste. I can't bear the least bit of salt in any dish."

"Oh, that's easily arranged!" said Ali Baba. And he told Morgiana not to put any salt in the meat for supper; and that made Morgiana suspicious.

"So your new friend is a man who will not eat salt with you!" she said. "I must have a look at him."

She did so, and, in spite of the new disguise, she saw that he was the captain of the thieves. Moreover, she saw a dagger hidden in his dress. So she said to Ali Baba:

"Tell your strange friend that one of your slave girls will come and dance before him after supper."

When the supper was over, she entered the room, attired in a beautiful dress, and began to dance the dagger dance. She whirled round and round in graceful movements, holding a dagger in her hand, and then rushed at Ali Baba and pretended to stab him. Then she lightly danced up to the captain of the forty thieves, but, instead of pretending to stab him, she drove the dagger into his heart.

"I recognized the villain!" she said.

Then she showed the dagger hidden in his dress. Ali Baba then married Morgiana to his eldest son, and gave her as a dowry a large share of the treasure in the cave of the forest.

THE FABLES OF ÆSOP THE SLAVE

A fable is a story told with a purpose, and the purpose is to illustrate a truth. Thus the fable of The Hare and the Tortoise illustrates the truth that slow, steady progress is better than occasional jumps. It is generally told by means of animals who are given all sorts of extraordinary powers. Fables are very old. They started in the East. The best we know were written by a slave named Æsop who lived 600 years before Jesus Christ. In the seventeenth century a French author, La Fontaine, was a famous writer of fables. His were clear, simple and without an extra word, yet they give us a very real picture of the animal world.

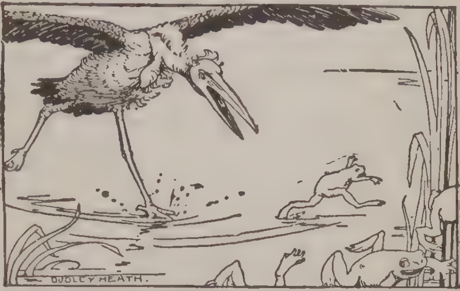
THE FROGS WHO WANTED A KING

IN the days of old, when the frogs were all at liberty in the lakes, and had grown quite weary of doing each one as he pleased, they assembled one day together, and, with no little clamor, petitioned Jupiter to let them have a king to keep them in better order and make them lead more honest lives.

They claimed that men and other living creatures had kings, and that surely frogs were as deserving of that honor as were birds or fishes or even honey bees.

Jupiter, knowing the vanity of their hearts, smiled at their request, and threw down a log into the lake, which, by the splash and commotion it made, sent the whole of the frogs into the greatest terror and amazement. They rushed under the water and into the mud, and dared not come within ten leaps' length of where it lay.

At length one frog, bolder than the rest, ventured to pop his head above the water and take a survey of their new king at a respectful distance. Presently, when they saw that the log lay quite still, others began to swim up around it, till, growing bolder, they at last leaped upon it and kicked it, and treated it with the greatest contempt.



Dissatisfied with so tame a ruler, they petitioned Jupiter for another king, upon which he sent them a stork, who no sooner arrived among them than he began laying hold of them and devouring them, one by one, as fast as he could, and it was in vain that they endeavored to escape him. Then they sent Mercury with a private message to Jupiter, beseeching him that he would take pity on them once more; but Jupiter replied that they were only suffering the punishment due to their folly, and that another time they must learn to let well alone, and not be dissatisfied with the natural condition into which they were born.

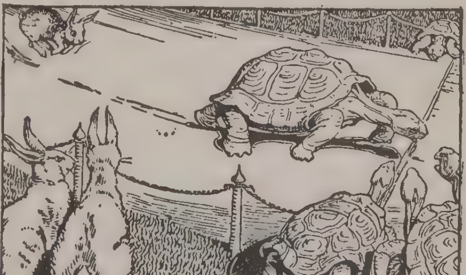
Let well alone.

THE HARE AND THE TORTOISE

ONCE a hare made fun of a tortoise for moving slowly. The tortoise replied, "Let us run a race." The hare did not care to run with the tortoise, but still he was willing to do it. The fox was chosen to mark off the bounds and see that the race was fair.

When he gave the word, both started to run. The hare ran fast for a while, but when he grew tired, he lay down and took a nap. The tortoise ran steadily but slowly. When the hare awoke he started to run again at a rapid pace, but he was too late. The tortoise was already at the goal.

Slow and steady wins the race.



THE FOX AND THE CROW

A HUNGRY fox saw a crow one day sitting on a tree with a piece of cheese in her beak.

"You are the prettiest crow I have ever seen," said the fox. "I wish you would sing a song. A bird with lovely feathers always has a sweet voice, and it is a very long time since I heard any fine music."

The silly crow was so proud at being asked to sing that she opened her mouth to caw, and, so doing, let the piece of cheese fall to the ground. The cunning fox snapped it up as soon as it touched the ground and said to himself, as he trotted away: "I said that she was beautiful, but I did not say that she was wise."

If we are vain and love to be flattered, we shall become foolish.

THE WOLF IN SHEEP'S CLOTHING

A WOLF once dressed himself in a sheep's skin, and was shut up at night with some sheep.

Before any of the pretty lambs were hurt, a shepherd came to the fold to get the fattest sheep in the flock. In touching them to see which was the best, he found an animal with hairy ears and a woolly back. It was the wolf lying down with the sheep to wait an opportunity for carrying off his prey.

"This is a strange kind of sheep," the shepherd said; and putting a rope about its neck, he strung the animal high up on a tree.

"Are you hanging a harmless sheep?" asked a passer-by.

"No," said the shepherd, "I am only killing a wolf in sheep's clothing."

Do not pretend to be good; be good.

THE FOX IN THE WELL

"HELP! Help!" said a fox who had fallen down a well.

A wolf ran to the edge of the well and saw the fox struggling hard to keep his head above water.

"My poor, dear friend," said the wolf, "you are indeed in great danger of losing your life. Believe me, I am very, very sorry for you. How long have you been down there?"

The fox replied: "If you wish to help me, waste no time in talking, but get a rope and pull me up. I cannot struggle any longer, and I shall drown."

The poor animal tried to climb the sides of the well. Each effort failed. He looked despairingly up at his friend.

The wolf sighed and walked away, and the fox sank into the water and was drowned.

An ounce of help is worth a pound of pity.

BELLING THE CAT

SOME mice lived in a house in which there also lived a great, fierce cat.

Even in the dark night they could not stir from their holes for fear of being pounced upon, and it was a hard thing for them to get anything to eat. One day they all met together to find out a way to escape from their foe.

"I will tell you what to do," said a young mouse. "It is quite easy. Tie a bell about the cat's neck. As the cat walks the bell will ring and we shall know where he is."

At this speech the mice squeaked for joy, until an old mouse asked: "But who will go out and bell the cat?"

None of the mice dared do this.

Some things seem easy at first, but they are easier said than done.

THE WITCH'S RING

A MILLER of Mayfield had three sons who all fell in love with the same girl. Her name was Marjorie, and she was the daughter of a farmer at Rotherfield, and the prettiest maiden in Sussex. But a rich old miser who lived in the village began to court her, and the farmer favored his suit and kept the miller's sons away.

At last Richard, the oldest son, determined to propose to Marjorie before the miser won her. On his way to the farm he met Mad Molly. She was an old, feeble woman, suspected of being a witch.

"Good day, my son," said Mad Molly. "Where are you going this morning?"

Richard hurried on without replying. On reaching the farm he blurted out a proposal of marriage, but Marjorie only laughed at him.

Rowland, the second son, then tried his luck. He also met Mad Molly, and hurried on without answering her, and he also returned in a downcast mood. Then Robin, the youngest boy, went to the farm. But he set out without hope. He was a strong, clever and gentle lad, but he had a very long nose, and this, as he knew, made him look ridiculous. He felt that even the miser was better-looking and had more chance than he.

When Mad Molly asked him where he was going he said: "On a hopeless errand, granny. I am about to call on Marjorie and ask her to be my wife."

"And your wife she shall be," said Mad Molly. "Look at this ring, my son. Now put it on your finger and say 'Bless it!'"

Robin did so, and his nose grew half an inch shorter, and he became very handsome.

"Now," said Mad Molly, "if Marjorie refuses you, give her the ring to wear. Then every time you say 'Drat it!' her pretty nose will grow half an inch longer, and she will become ugly and be very glad to marry you. Then you have only to say 'Bless it!' and her nose will grow shorter and she will recover her beauty and be again the prettiest maiden in Sussex."

Robin ran to the farmhouse, and as Marjorie was out, he sat in a chair and closed his eyes. Just then the miser entered, and saw the ring on his finger.

"An engagement ring!" he said. "I'll keep that."

He pulled it off Robin's finger and put it on his own. But Robin was awake, and he began to whisper "Drat it! Drat it!" and the miser's nose grew longer and longer.

"Something is stinging me!" cried the miser. "My nose is swelling frightfully!"

"Something is stinging me!" cried the miser, running off to a doctor. "My nose is swelling frightfully!"

Happily, Robin did not want his ring any more. Marjorie was surprised to see how handsome he looked. She had always liked him for his gentleness, and she now fell quite in love with him, and agreed to marry him as soon as he bought a farm.

"Return my ring and I'll cure you for one thousand pounds," said Robin to the miser.

The miser at last did so, and Robin and Marjorie were married and bought a farm, and lived there very happily together.

THE NEXT STORIES ARE ON PAGE 755.

LANDMARKS OF EARLY DAYS

At Jamestown, Virginia, founded in 1607, the first successful English settlement in America, was built the first Anglican church on this continent. After the unhealthy location of the settlement had led to its being abandoned, decay began to turn its walls into ruin. The old church tower stands a solitary relic of the earliest town life in Virginia, and the brick church behind it, erected in 1907, was modeled as nearly as possible upon one of the old buildings on the same site. Photo, Ewing Galloway.

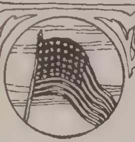
To Plymouth, Massachusetts, many pilgrims journey as to a shrine. With widely different names now, they all look back to the few ancestors who formed the little band on the Mayflower in 1620. Under the canopy pictured here is Plymouth Rock, on which the Pilgrims first set foot; on the canopy is inscribed: "Erected by the National Society of the Colonial Dames of America to commemorate the three-hundredth anniversary of the landing of the Pilgrims." © A. S. Burbank, Plymouth, Mass.

THE HISTORY OF THE UNITED STATES

WHEN America had been known more than a hundred years, only two small settlements, both Spanish, existed in the present United States, one at St. Augustine in Florida, and the other at Santa Fé in New Mexico, though there were settlements on Porto Rico. This was soon to be changed, for after 1600 several settlements were made only a few years apart. The English made a settlement in Virginia in 1607, and followed with another in Massachusetts in 1620. The Dutch established a trading-post on Manhattan Island before 1614. Other English settlements were soon made in the present territory of the United States, while the French at first spent all their strength in Canada.

BUILDING HOMES IN THE NEW LAND

CONTINUED FROM 396



YOU have already been told that in the territory now making up the United States, the explorers wasted their time in seeking gold, or a short way to Asia, for more than a hundred years. At the end of these years of discovery and exploration, only two small Spanish settlements were to be found in what is now the United States proper. You no doubt remember that there was a small Spanish fort at St. Augustine in Florida, which is, therefore, the oldest town in the United States, and another at Santa Fé, New Mexico, which is second in age. There was also a settlement or two in Porto Rico, now United States territory. Northward not a single white man had made a home, except here and there one had adopted the life of the Indians. Perhaps, too, some members of Sir Walter Raleigh's "Lost Colony of Roanoke" were still alive among the Indians somewhere in the deep forests in what is now North Carolina or Virginia.

America had been a great disappointment to all the exploring nations except Spain. That country had found treasures in Mexico and Peru, where they had made slaves of the people whom they found there. Other nations had found neither gold nor other treasures, and because America prevented them from reaching Asia, they wished that the two great continents were out of the way.

The shrewd Sir Walter Raleigh, one of the wisest of Englishmen, had come to believe that profit might be made if men would go to live in the land and cultivate the soil; but even the colonists he sent out spent more time seeking gold and looking for a passage to Asia than they did in planting crops. So all Raleigh's money soon went and no colonies remained on the land which Queen Elizabeth had given him.

HARD TIMES IN ENGLAND MAKE PEOPLE THINK OF AMERICA

About the year 1600 people in England were finding it harder and harder to find work, for the following reason. The people in the Netherlands were weaving more and more woolen cloth, and they thought that English wool was better than any other. So the English landowners had found that they could make more money by turning their land into pastures for sheep than they could by farming. Now, a few men can take care of the sheep on a large piece of land, and men who had been working on the farms could find nothing to do. This made many people think about going to Virginia, though that country seemed very far away from England.

King James I, who had succeeded Queen Elizabeth, gave a charter, which is a paper telling of rights, privileges and duties, to a company, called the Virginia Company, in 1606. This company had two branches, one called the London and the other the Plymouth, because many of the men interested lived in one or the other of these towns. The charter granted to the Plymouth Company the land from about Long Island Sound to Nova Scotia; to the London Company, the land from about Cape Fear to the mouth of the Potomac River. The strip between was to belong to the company which colonized it first. All the grants reached to the Pacific Ocean, which was still thought to be only a few hundred miles from the Atlantic.

THE FIRST PERMANENT ENGLISH COLONY IN AMERICA

Both companies soon sent out colonies. We shall mention the settlement of the Plymouth Company first, though it really came second. The colony sent out settled at Sagadahoc on the Kennebec River in what is now Maine; but the next winter was very cold, they had little to eat, and the colonists quarreled so much with one another that they were all glad to go home in 1608. The story of their hardships frightened others, and the Plymouth Company sent out no more settlers. The land was soon taken away from it.

When the London Company was ready, in December, 1606, it sent more than one hundred men to Virginia in three little ships called the Susan Constant, the Godspeed and the Discovery. They reached the coast in April, 1607, and sailed up a river which they called the James, and settled on a low point of land which was almost an island, about forty miles from the mouth. This they called Jamestown in honor of the king.

Misfortunes followed the colony for fifteen years. The first was that the sailors saw shining sand, which they were sure was gold along the streams and waited to load the ship with it. The shining grains were only "fool's gold," but while the sailors were staying they were eating the food brought over to feed the colonists until they could feed themselves. The place was swampy, and during the hot summer fifty persons died of fever. But for one man the rest would have given up. This man was John Smith, who was a great boaster and was not always truthful; but he was a strong, vigorous man who knew how to get food from the Indians, who did not like to see the white men in their country.

THE COLONISTS ENTIRELY UNFIT FOR HARD WORK

The men of the colony were not suited to the hard work of making homes in a new country. Many of them were classed as "gentlemen," which then meant people who did not know anything about work with their hands. Others had been merchants, and among them were jewelers, perfumers and the like. Only a few were accustomed to hard work. There were six carpenters, one blacksmith, one mason and a few laborers. They wasted their time hunting for gold, instead of building houses, cutting down trees and planting corn. Many of them lived in holes in the ground, for they thought if they found gold they could either go back to England or else get others to work for them. Besides, if they did work, all that they made went into one storehouse and all shared equally. Lazy men did not work because they thought that others would produce food for them.

In 1609 about five hundred more men came out, but they were of the same sort, and Captain John Smith, who was not liked by the lazy, went home to have a wound cured. Since there was not enough food for everyone, the next year they killed and ate all their animals, including their horses and dogs. In June, 1610, only about sixty were left out of nearly six hundred who had come to Virginia.

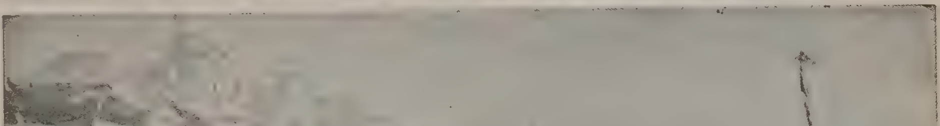
SIR THOMAS DALE AND HIS HARSH LAWS MAKE THE LAZY WORK

Finally they all got into four little boats and started to leave the country, but near the mouth of the river they met the new governor, Lord De la Warr, who was coming with supplies. From this name we get Delaware, the name of one of our states. Lord De la Warr soon went back to England; and a very strong, but a very stern man, Sir Thomas Dale, came out to govern the colony, and brought more men and supplies. He punished the lazy and those who broke the laws very harshly, but he made men work. He also allowed each man to have a piece of land for himself and to keep

THE VOYAGE OF THE PILGRIM FATHERS

© A. S. Burbank, Plymouth, Mass.

The Mayflower—staunch little vessel that bore to a new home on an untried shore the hopeful Pilgrims, with such of their belongings as there was room to carry—is here pictured in Plymouth harbor, Massachusetts, in the desolation of winter, icebound, with the bleak and barren coast in the background.



The men who first came to America from England were, for the most part, not suited to be colonists, but they were afterward joined by men of a better class. Later colonists were of a very different kind: men and women driven from England by the tyranny of King James I, who insisted that everyone must worship God in a certain way. There were many people who disliked this way, and some thought that if they went to America they would be able to worship as they pleased. The king readily gave them permission to go. This band, called the "Pilgrim Fathers," sailed in the Mayflower, and the picture shows them embarking on the long voyage to a land where homes must be made.

whatever he made on it. Another thing helped them. You have already read that tobacco was taken to Europe from America. The habit of using it spread, and the demand grew larger. Since there was good profit to be made from growing tobacco, many industrious farmers went to Virginia to live.

WOMEN SENT OVER FOR WIVES FOR THE SETTLERS

During the first years of the colony few women came, but in 1619, ninety young women were sent over by the Company. If they married, their husbands were required to pay the expenses of the journey. They were not sold, for they had the right to marry anyone they pleased, but all of them did marry very soon, and several other shiploads were sent over. Homes were now built, and men no longer thought of breaking up the colony, which had now several little villages along the James River or the streams which ran into it.

THE BEGINNING OF NEGRO SLAVERY IN AMERICA

Another important thing happened in 1619. A Dutch ship passing by stopped to buy provisions and sold the colonists twenty negroes who were needed to work in the tobacco fields. This was the beginning of negro slavery in the American colonies. Afterward it spread over them all, and continued after they became a nation. There were white slaves also in Virginia, just as there were later in other colonies. These were either criminals who were sent over and forced to work, or else they were poor persons called "redemptioners" who agreed to work for a number of years in return for the payment of their passage to the new land. When their term of service was over their master was compelled to give them a sum of money, good clothes and sometimes a horse. Some of these men, after they were set free, became successful farmers or business men. On the other hand, some were very lazy and bad, and lived like Indians.

THE FIRST LEGISLATURE IN AMERICA MEETS AT JAMESTOWN

One more very important thing happened in this year, 1619. There were now eleven little settlements, and each of them was given permission to elect two citizens to help make laws for the colony. They met in the little church at Jamestown, July 30, 1619, and that is an important date, for it is the time of the meeting of the first legislature in America.

Now that we have taken the Jamestown Colony through the hardships of its early years, let us turn to the first years of another English colony. You remember that the Plymouth Company tried to make a settlement on the coast of Maine in North Virginia, as it was then called, the same year that Jamestown was founded, but failed. After Captain John Smith left Virginia the Plymouth Company employed him to explore and make a map of their territory. This he did in 1614, and called the country New England, and by this name it is known to-day. But the Plymouth Company did not succeed in planting any colonies.

DIFFERENT RELIGIOUS OPINIONS IN ENGLAND

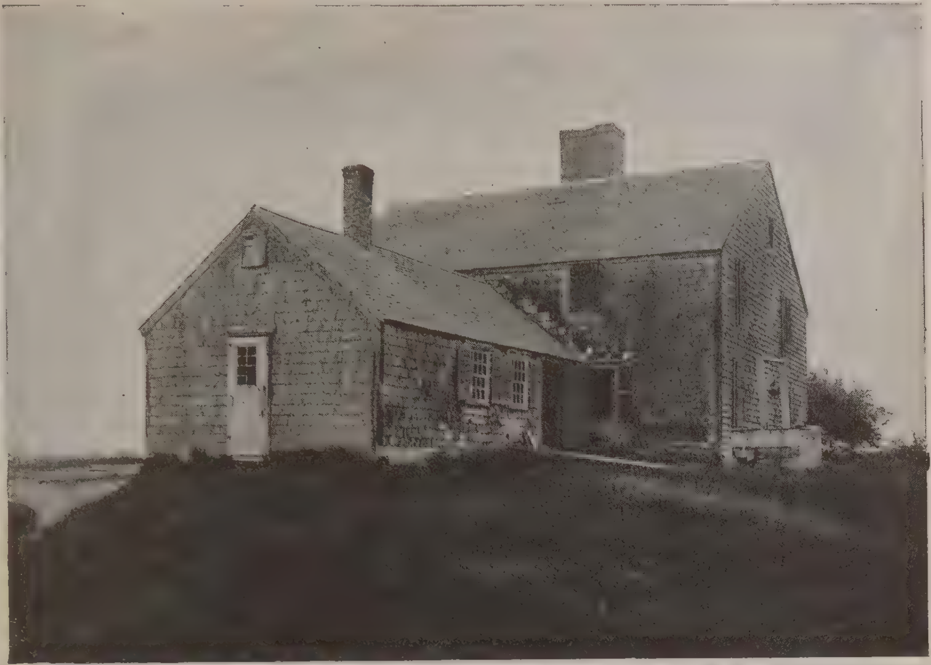
You will read, in the chapters on English history, of the Reformation, and how under Henry VIII and his children the Pope was declared to have no more power in England, but that the English Church should be independent. Some of the people did not think that the changes made in the doctrines and the forms of worship went far enough. They said that they wished to purify the English Church and therefore they were called Puritans, but they still belonged to the Church. There were others who went further. They said that each little band who believed the same way ought to be entirely independent. At first they were sometimes called Puritans, but commonly they were called Separatists, because they separated themselves from the English Church.

Rulers at that time did not think it safe for men to think differently about matters of religion. They thought that if men were allowed to refuse obedience to the particular Church which was established by law, they would soon disobey the law in other matters, and perhaps refuse to obey their rulers in other than religious matters.

ENGLISHMEN GO TO HOLLAND TO HAVE FREEDOM OF WORSHIP

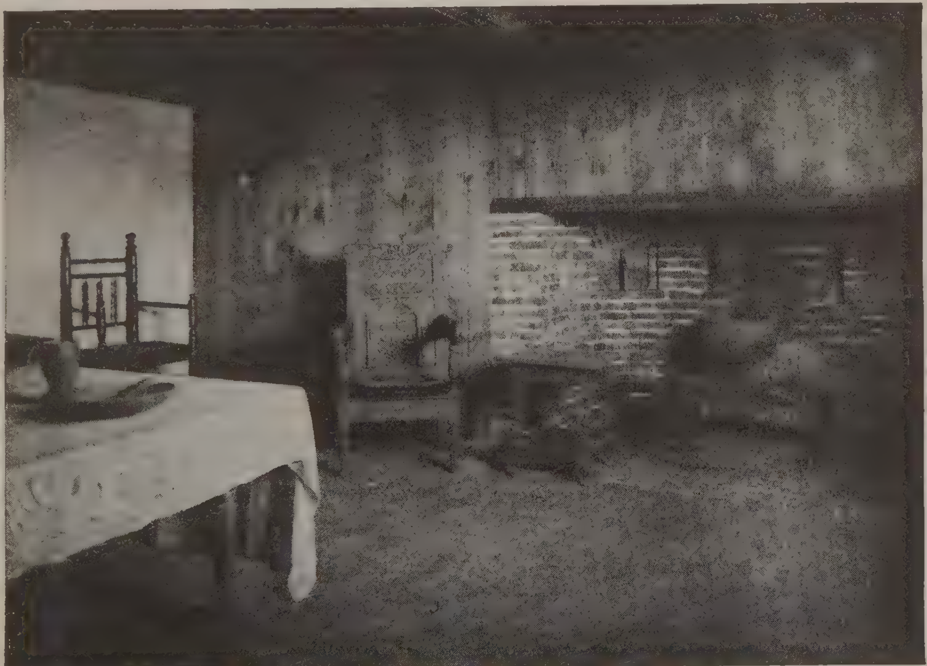
Many of the Separatists escaped to the Netherlands, where they were allowed to believe as they pleased. Among them were members of a little

EARLY HOMES IN NEW ENGLAND



© A. S. Burbank, Plymouth, Mass.

In Duxbury, Massachusetts, not far from Plymouth, stands the John Alden house as you see it here. In it lived and died John Alden—last survivor of the men who signed the Mayflower Compact—and Priscilla Mullens, his wife. Their romantic story is told in Longfellow's Courtship of Miles Standish. In the kitchen of the old house is a broad fireplace similar to the one below.



Photo, courtesy Metropolitan Museum of Art.

The room shown in this picture was in the Hart house at Ipswich, Massachusetts, which was built about 1640. The great fireplace, with its ovens, its crane and its andirons, was the centre of the family life. Above this fireplace is a simple band of decoration. The furniture is plain and strong.

congregation at Scrooby, which began to move in that wonderful year 1607. This congregation, after stopping for a little while in Amsterdam, removed to the city of Leyden, where they worked very hard to live. But after ten years the leaders began to talk of removing to America. Work was hard, some of the young people no longer believed as their fathers did, and were growing up Dutchmen instead of Englishmen. Though they had been forced to leave England, they still loved their native land. So they planned to build a new home where they would not be disturbed. They arranged with the managers of the London Company to get land, and in 1620 left Holland in a ship called the Speedwell to go to Southampton in England, where friends were to join them in another ship called the Mayflower. When they started toward America the Speedwell was found to be leaking, and that ship went back to England. Passengers from both ships were crowded into the Mayflower.

THE PILGRIMS SET OUT TO MAKE NEW HOMES IN AMERICA

At last, the Mayflower, with a part of the congregation, set out with one hundred persons on board. The ship was crowded, the weather was bad, and they did not reach the American coast until November, 1620, when they found they were on the shores of Cape Cod instead of on the coast of what is now New Jersey, where they had permission to land. They decided to stay where they were, as they thought that they could get permission from the Plymouth Company, and after exploring the coast, landed December 21, at the place which John Smith had already called Plymouth. Later the colony did get permission to use the land from the New England Council, which succeeded the Plymouth Company, but it never had a charter from the king.

If the Virginia settlers found the summer hotter than anything they had known in England, these found the winters terrible. You must remember that they did not have close houses, furnaces, and coal with which to heat their houses. They lived in log cabins with no floors or, at best, with floors of logs split in half. Then, too, the climate seems to have been colder then than it is now. During the first winter more than half of the little company died, including the governor.

Like the Jamestown Colony, they began by putting all the goods into one storehouse, for they had borrowed money to bring them over and had agreed to work together to pay the debt. But here, too, it was found that men would not work so well when each man could not have the fruit of his own labor, and the system was soon given up. They did not have much trouble about their rulers, for William Bradford, who was elected after Governor Carver died, was elected every year, except five, until his death in 1657.

THE PURITANS IN ENGLAND DECIDE TO MOVE ALSO

As the years went on, the Puritan party in the Church of England was persecuted. The bishops and the king were determined to break it up, and some of the leaders determined to go to New England, as the Pilgrims had done. In 1628 they bought the right to settle on the land between the Charles and the Merrimac rivers, and the same year John Endicott led a few persons and settled at Salem. He was not a wise ruler and made many curious laws. He compelled the women to wear veils in church for fear that men might look at them and not listen to the sermon. He thought it was wrong to wear a wig and punished a man who wore one. The next year a larger party came out, and in 1630 John Winthrop led nearly a thousand persons, with many cattle and horses, and made several settlements on Massachusetts Bay.

You must keep in mind the difference between the Pilgrims and the Puritans. The Pilgrims, at Plymouth, who had separated from the Church of England before they came over, were few, and most of them were poor. Many of the Puritans were rich, and they did not separate from the Church until after they had arrived in America. Though in many things the Pilgrims and Puritans thought alike, they founded separate colonies which were not joined together for many years.

THE FIRST COLLEGE WHICH WAS FOUNDED BY THE PURITANS

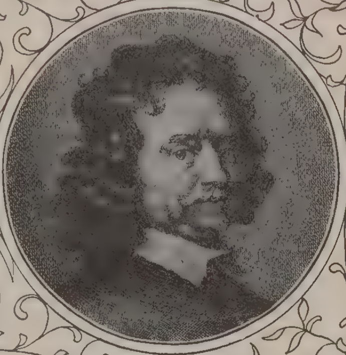
The Bay Colony grew very rapidly, and before 1634 nearly five thousand settlers had come. They did not suffer

GREAT MEN IN COLONIAL DAYS

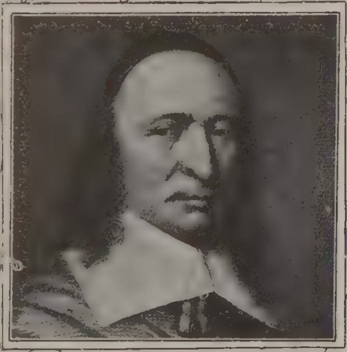
J. SMITH

CALVERT

MONK



CLARENDON



STUYVESANT

PENN

These six men had a great deal to do with the early days of the colonies. Captain John Smith saved Virginia, and explored and named New England. Lord Baltimore founded Maryland. Peter Stuyvesant was the last Dutch governor of New Amsterdam, and William Penn founded the great state named after him. George Monk, Duke of Albemarle, was commander of the English army, and Edward Hyde, Earl of Clarendon, was one of the most powerful noblemen of his time. They helped to found Carolina.

so much, because they had more money with which to buy things in England, and they had learned from the experience of the other colonists. In 1636 they decided to start a college to train ministers for the churches. A young minister, John Harvard, died in 1638, and left his books and his money to the college, which was then called after him.

Though these Puritans had come to the New World in order to have their own way in religion, they were not willing to give the same rights to others. They banished a young minister named Roger Williams because he taught that it was not right to compel a man to support a church in which he did not believe, and that the judges had no right to punish a man because he broke the rules of the Church. Williams said also that the King of England had no right to grant the land on which they lived, because it belonged to the Indians. Williams escaped before he could be sent back to England, and took refuge among the Indians. He bought some land from them on which he began to build the town of Providence in 1636. Other persons who were driven out of Massachusetts Bay because of religion also moved southward; and their settlements, together with Providence, became the colony of Rhode Island, where every man was allowed to think, believe and teach what he pleased.

NEW AMSTERDAM FOUNDED BY THE DUTCH ON MANHATTAN ISLAND

Though we went from Jamestown to Plymouth, another colony was founded before Plymouth. You remember that Henry Hudson in 1609 sailed up the river which now bears his name, and claimed the country for the Dutch. He also found that the Indians had many furs which they were willing to exchange for a few beads or a hatchet. These furs seemed as good as gold to the Dutch, and they soon sent out traders to gather them. Some say that there were a few houses on Manhattan Island in 1614. The same year or early in 1615 Fort Nassau (now Albany) was founded, and settlements in New Jersey also were soon made.

The Dutch claimed all the country between the Delaware and the Hudson rivers, and called it New Netherland. In 1626 Peter Minuit, who had been sent over to oversee the traders, bought Manhattan Island from the Indians for twenty-four dollars' worth of beads and other trifles, and the town that was growing up at the foot of the island was called New Amsterdam.

Next, large tracts of land along the river were offered to any men who would bring over fifty settlers at their own expense. Soon there were many farms along the rivers, and the owners of the tracts, who were called "patroons," lived like the English nobility and had great influence.

LORD BALTIMORE FOUNDS A HOME FOR HIS CATHOLIC FRIENDS

George Calvert, whom King James I made Lord Baltimore, also wished to found a colony. He was a Roman Catholic, and had it in his mind to build up a colony where the laws about religion should not be so strict. If he could do this, those of his religion could have peace, as they were not well treated in England. At first he tried to make a settlement in Newfoundland, but the climate was too severe. Then he persuaded King Charles I, who sympathized with the Catholics, to make him Lord Proprietor of a great tract of land north of the Potomac River. He died just as the charter was about to be granted, and it was given to his son, the second Lord Baltimore, and was called Maryland, to compliment the Queen Henrietta Maria. For all this great tract of land the only rent he was to pay to the king was two Indian arrows every year, and one fifth of the gold and silver that might be found. Protestants as well as Catholics were welcomed.

The Lord Proprietor had great powers. He could coin money, grant titles of nobility, appoint judges, and pardon criminals. If he decided to call a legislature, the laws which were made did not have to be submitted to the king. In fact the Lord Proprietor was almost like a king. We shall see that other colonies, which were founded later, were governed in the same way.

The first settlement was made in 1634, and grew rapidly. But this same territory had been granted to Virginia, and the Virginians did not like to see it given to another colony. So some of them joined with those in Maryland who were not Catholics and captured

STIRRING SCENES IN COLONIAL TIMES

Nathaniel Bacon raised a force to attack the Indians in Virginia, without the consent of Governor Berkeley, who became so angry that he threatened to hang Bacon.

Quakers refused to take off their hats to any man. They were persecuted in many colonies, and in some cases were put to death. Here we see the Quakers on trial.

Miles Standish was the soldier of the Plymouth colony, and had several contests with the Indians, who were forced at last to leave the little colony in peace.

the colony. It was given back to Lord Baltimore by Oliver Cromwell, but later those who were not Catholics got control and forbade any more Catholics to come in. Finally the fourth Lord Baltimore turned Protestant, his rights were restored, and his family held control until the Revolution.

SWEDEN ALSO TRIES TO FOUND A COLONY

Just about the time that Maryland was founded, Sweden was a more powerful country than it is to-day. The great King Gustavus Adolphus hoped to found a colony in America, and gave permission to some of his subjects to send out men. He died, however, before anything had been accomplished. Under his daughter Christina, who succeeded him, a few men settled on the Delaware River in 1638, and called the colony New Sweden. They were led by Peter Minuit, a few years earlier the first Dutch governor of New Netherland, who had left the Dutch service. The Dutch still claimed the country, and Peter Stuyvesant, the one-legged governor of New Amsterdam, was able to make them yield to his power. This was the beginning of the colony of Delaware.

THE DUTCH LOSE THEIR COLONY TO THE ENGLISH

But Governor Stuyvesant also had troubles. He was very hot-tempered, did not believe in giving the people any voice in the government, and many in New Amsterdam did not like his ways. The English had always claimed all of North America, because of the discoveries of Cabot, and as soon as their troubles at home were over, a fleet came out in 1664 and ordered New Amsterdam to surrender. The people, who did not like Governor Stuyvesant, would not fight, and so the English took possession, and called it New York in honor of the king's brother, the Duke of York, who was later to be James II of England. In 1673 the Dutch again got possession, but kept it only a few months, after which they lost their colony forever.

THE BEGINNING OF NEW JERSEY AFTER THE CAPTURE OF NEW YORK

The Duke of York the same year granted the southern part of his province to two of his friends, Lord Berkeley and Sir George Carteret. The last-named had been governor of the island of Jersey in the English Channel, and so the province was named New Jersey. Settlers came from New York, New England and Old England. Among them were many Quakers. Some Quakers bought Berkeley's share, and after a time the province was divided into East Jersey and West Jersey. There were quarrels with the governor of New York, who claimed the right to rule the Jerseys, but the disputes were settled at last in favor of the Jerseys. Then William Penn and other Quakers bought Carteret's share, or East Jersey. Finally the two were again united.

Though it was not next in time, we shall here tell the story of the founding of Pennsylvania. William Penn was the son of a distinguished English naval officer who was a great friend of the royal family. Very much to the disgust of his family, young Penn became a Quaker, and sometimes wandered over the country preaching to all who would listen to him.

WHAT THE QUAKERS BELIEVED AND TAUGHT

The Quakers at this time were very much despised. They said that it was wrong to show respect to people because of their position, and therefore they would not take off their hats before rulers, or address them by any title, not even Mister. They said that it was wrong to wear jewelry or fine clothes, or to follow the fashions. They did not believe in priests or bishops, and they refused to swear in court. They did not believe in war and would suffer any punishment rather than serve in the army.

It is said that King Charles II had owed Penn's father a large amount of money which he did not want to pay. He liked Penn in spite of the fact that he was a Quaker, and so in 1681 gave him, instead of the money, a large tract of land lying west of the Delaware River.

RAPID GROWTH OF THE QUAKER COLONY UNDER PENN

The rules that Penn made for the settlement were very liberal. No one was to be allowed to be troubled for any matter of religion, the punishments for crime were not so harsh as they were in the New England colonies, and men could get land upon easy terms. In

1683 the city of Philadelphia, which means "Brotherly Love," was laid out, and soon grew to be a handsome town with broad streets and brick houses. Settlers came fast to the province, and it did not suffer any of the hardships which made the stories of Virginia and Plymouth so terrible. Not all of the settlers were English. Many Germans came over, and many of the inhabitants of Ireland also. There were also Swedes, Welsh and French. Penn succeeded in having the Duke of York, who became James II in 1685, turn over Delaware to him, since the colony of Pennsylvania had no seacoast.

COLONIES NEXT WERE FOUNDED IN THE SOUTH

All the colonies of which we have just been reading have been on the middle or northern coast. Now we come to some farther south, where three colonies were yet to be founded. As early as 1629 Charles I had granted "the province of Carolana" to Sir Robert Heath, but he made no attempt at settlement. As the years went on, restless men from Virginia moved southward, and here and there men from other places settled along the coast, where they were under no law or government except their own will.

When Charles II was restored to his throne, in 1660, some of his friends asked him for a grant of land in America. As such a gift would not cost him anything, he granted, in 1663, to eight Lords Proprietors a strip of land three hundred and fifty miles wide south of Virginia, and extending to the Pacific Ocean. This was called Carolina. Some of the most important of these Proprietors were the Duke of Albemarle, the general of the army, the Earl of Clarendon, two of whose granddaughters became queens of England, and Lord Ashley, afterward Earl of Shaftesbury. You can see two of these on another page. In 1665 the grant was made larger, so that it included all the land in what is now North and South Carolina, Georgia and the states west of them.

The Proprietors published what we should now call advertisements for settlers, offering favorable terms; and a number took up land in Carolina, though they did not pay much attention to the Proprietors. If they liked the looks of land upon which no white man was living, they settled on it without asking anyone's consent. It was easy to get enough to eat in Carolina. The waters were full of fish. Turkeys, ducks, deer and other game were plentiful, and the winters were not so severe as they were farther north.

Settlers from Virginia occupied the coast next to that colony, and a governor was appointed in 1664. Another settlement was soon made near the present site of Charleston, South Carolina. There was still another tiny settlement at the mouth of the Cape Fear River, but it did not last.

NOBLES, FREEMEN AND SLAVES IN A NEW COLONY

The Proprietors adopted in 1669 a very wonderful form of government for the colony, called the "Fundamental Constitutions." It provided for three social ranks—nobility, freemen, and serfs who were to be little better than slaves. If a man was born a serf he must remain one all his life. The people in Carolina had been entirely free, and they did not worry about this constitution, which was not even suited to England at that time, and was silly in a country where there were only hunters, fishermen and small farmers.

The settlement in the South around Charleston grew faster than any in the North, and finally the province was divided into North and South Carolina. The Proprietors had not started the province for religious reasons, as Lord Baltimore and William Penn had done, and when they found that they were not likely to get much profit from it, paid little attention to the people. Some of them sold their shares for small sums, and were glad to get rid of the troublesome affair.

HOW THE PEOPLE OF NORTH CAROLINA TREATED SOME GOVERNORS

Most of the governors sent out were not fit to rule. Twenty in all were sent out to the northern province, and the people drove away six of them. Once for two years there was no governor or other ruler in North Carolina, but the people did not care. If there was no governor, there were no taxes to pay and that pleased them very well.

Many French Huguenots and some Germans and Swiss came over. A town was founded and called New Berne.

Before they were entirely settled, the whole northern province was attacked by the Tuscarora Indians, and for four years there were many battles. The Proprietors would not send aid, and for a time it seemed as if the colony would be broken up. At last, with help from South Carolina, the whites defeated the Indians so severely that they moved to New York and joined the Five Nations, which were afterward known as the Six Nations.

PIRATES ON THE COAST AND RASCALS IN OFFICE

The colony was at this time troubled with pirates who hid their small vessels in the rivers or in the shallow sounds, and lay in wait for trading vessels. Finally the worst one, Edward Teach, who was called Blackbeard, was defeated and killed after a bloody battle.

The people were so tired of the Proprietors that they asked the king to take over the government of the colony. This he did in 1729, paying each of the Proprietors about $12,000 for his share. One of the eight refused to sell, and a strip of land seventy miles wide was set off for him along the border of Virginia, but he no longer had rights of government.

A COLONY FOUNDED FOR POOR MEN WHO WERE IN DEBT

Just about this time the last southern colony was begun. At that time in England a man could be put in prison for debt, even if it had not been his fault, and might be kept there at his own expense until the debt was paid. General James Oglethorpe was a kind man who had been a brave soldier and a member of Parliament. He asked the king to give him some land in America to which he might take some of these men, where they could have a chance to begin life over again. In 1732 George II gave him permission to make a settlement, and the colony was named Georgia in his honor.

Oglethorpe came over in 1733 and founded the town of Savannah, which soon began to grow. The colony was not a great success. Many of those who came over did not do any better in Georgia than in England, and some were ungrateful. Oglethorpe went back to England, and in 1752 the king took over the government himself.

If you have counted the colonies as we have told about them you know that we have mentioned eleven. Of course every boy and girl knows that there were thirteen colonies at the time of the Revolution. We shall now go on to tell about the other two, though they were founded earlier than some we have already named.

WHAT THE FOUNDERS OF MASSACHUSETTS BAY BELIEVED

The founders of the Massachusetts Bay Colony wished to worship God in their own way, but they did not intend to allow religious freedom, and they did not believe in the rule of the people. They thought that the elders in the churches ought to be the rulers in the colony also. Only church members were allowed to vote, and they were told that they must always vote as the ministers advised. Anyone who did not believe and act as the ministers and elders told him was punished or banished from the colony.

THE THREE TOWNS ON THE CONNECTICUT RIVER

Each little town in Massachusetts was almost altogether settled at first by those who had known one another in England. The settlers at Newtown (now Cambridge) were under the charge of Rev. Thomas Hooker, who believed that the people ought to have more voice in the government and also that good men, even though they were not church members, ought to vote. Then, too, the land at Newtown was not very good. So, before there was an open quarrel, he and his congregation moved in 1635 and 1636 to the Connecticut valley, where they founded the town of Hartford. The Dutch had had a small fort here, but had given it up on the approach of the English, who were also settling on the coast. The people of Dorchester moved and settled Windsor, and the Watertown people settled Wethersfield about the same time. These were the "three river towns" of Connecticut. In 1639 the people of these towns met at Hartford and agreed not to be subject any longer to Massachusetts, but united into a republic to be governed by written laws which they drew up. Their land was good, and the colony prospered, though they had trouble with the Indians.

Just about this time a party from England, which also wished to found a colony, settled at New Haven. They were very strict in their ideas, and at first had no law except the Bible. Later, against its will, this colony was joined to Connecticut, which had already bought a little colony at Saybrook.

THE LITTLE COLONY FURTHEST NORTH

One more colony is to be mentioned, but it was always such a weak colony that we almost overlooked it. This was New Hampshire, which was founded by Captain John Mason, who obtained a grant of land in 1629. A few settlers came, and among them were some who had been driven out of Massachusetts because of their opinions in religion. After Captain Mason died, no one paid much attention to his rights, and in 1641 Massachusetts took the government. It remained under that colony until 1679, when it was made a separate province.

THE GROWTH OF THE COLONIES ALREADY MENTIONED

Now let us carry forward a little the story of some of our colonies, which we left as soon as they became self-supporting. We shall not tell you very much about how our ancestors lived, for we shall have some other articles in our Book of the United States which will describe their manners and their customs, their schools, their sports and what they thought about many things.

We left the Virginia Colony just after the three important happenings of the year 1619. There was a serious Indian war in 1623, but it could not stop the growth of the colony. The next year King James took away the charter of the Company because he thought it was too democratic, and the governors were afterward appointed by the king, who sometimes chose well and sometimes made mistakes. In 1642 one of Virginia's greatest governors, Sir William Berkeley, was sent out and held the office most of the time for the next thirty-five years.

KING CHARLES II ASKED TO BECOME KING OF VIRGINIA

After Charles I was executed in England many of his followers, called "cavaliers," came to Virginia, and the colony invited the young Charles II to come over and be king of the colony. The people did not live in towns, as in New England, but each man tried to get a large plantation, where he could live like a country gentleman of England. In spite of Indian troubles and an uprising of the people called Bacon's Rebellion, the colony continued to grow, and kept the first place in population down to the Revolution.

WHAT FINALLY BECAME OF THE PLYMOUTH COLONY

The Plymouth Colony grew very slowly at first, for at the end of twenty years it had only three thousand people, but afterward grew faster. It did not persecute those differing in religion so bitterly as did the Bay Colony, but in 1692 was joined to that colony.

The Bay Colony grew rapidly from the beginning, in spite of Indian wars, about which we shall tell in the next chapter. The people held steadfastly to their Puritan opinions, and some returned to England to fight under Cromwell. They whipped Quakers, branded them with a hot iron and banished them from the colony.

SIR EDMUND ANDROS

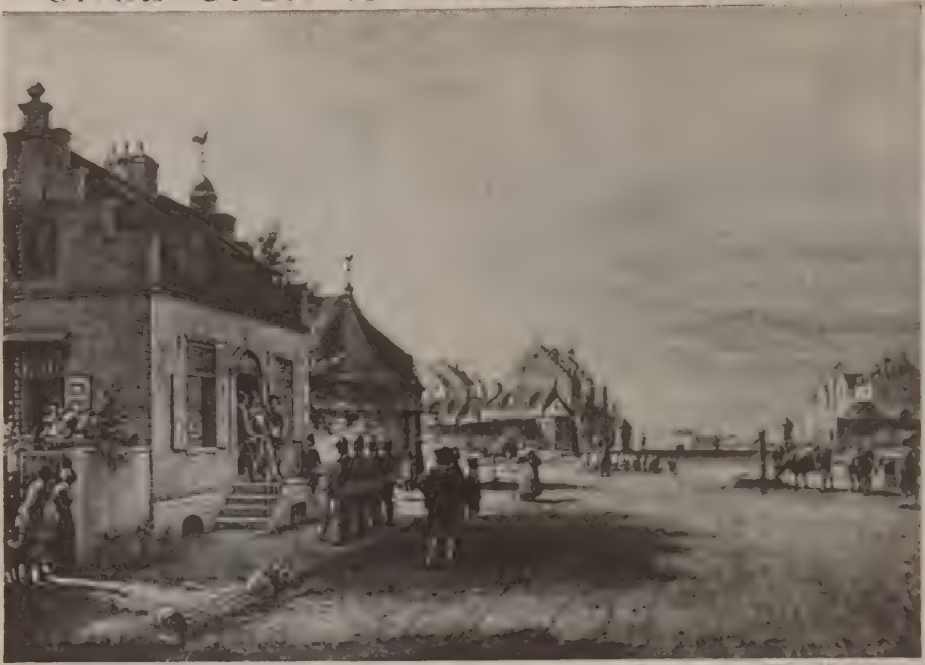
Finally, in 1684, the king took away the charter, and all of New England, New York and New Jersey were put under one governor, Sir Edmund Andros, in order that they might be better able to resist the Indians and the French. When James II was driven out of England, Andros was deposed. The people hoped for greater freedom, but were disappointed.

We have already told you of Maryland, Connecticut and Rhode Island, about which there is not much more that is important to be said. In New York some of the royal governors were good and some were bad, some protected pirates and others got drunk on the streets or in common saloons. That famous pirate, Captain Kidd, was a merchant of New York before becoming a pirate. The trade of New York grew all the time, and then, as now, people of many nations were to be seen on the streets.

In the next article we are to learn how the settlements which France had been busy founding in Canada and in the Mississippi Valley, were seen to prevent further growth of the colonies of which we have spoken. That article will tell us of the struggle for the continent which did not seem large enough for both nations.

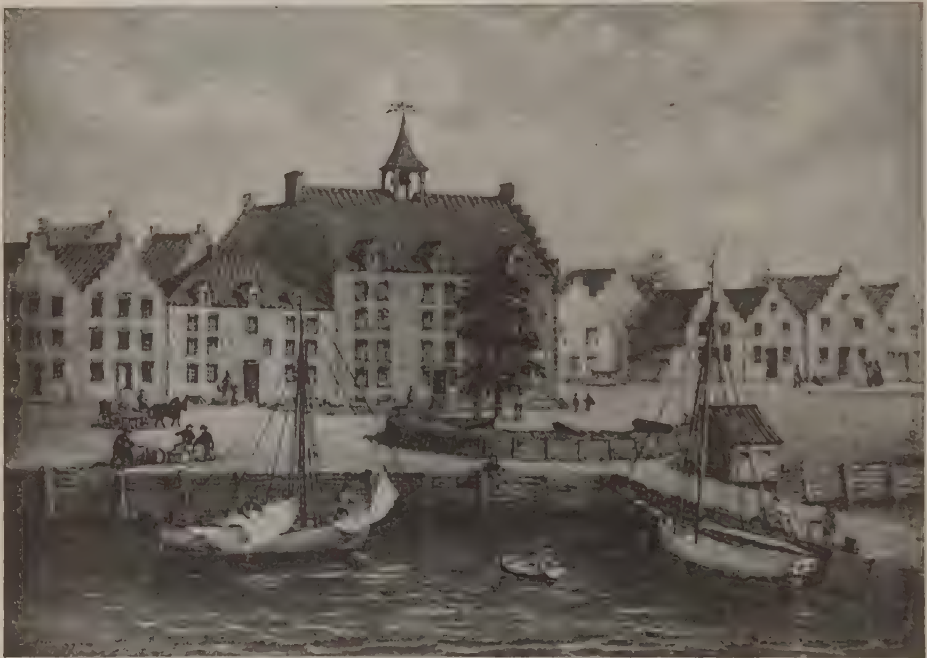
THE NEXT STORY OF THE UNITED STATES IS ON PAGE 729.

ONCE UPON A TIME IN NEW YORK



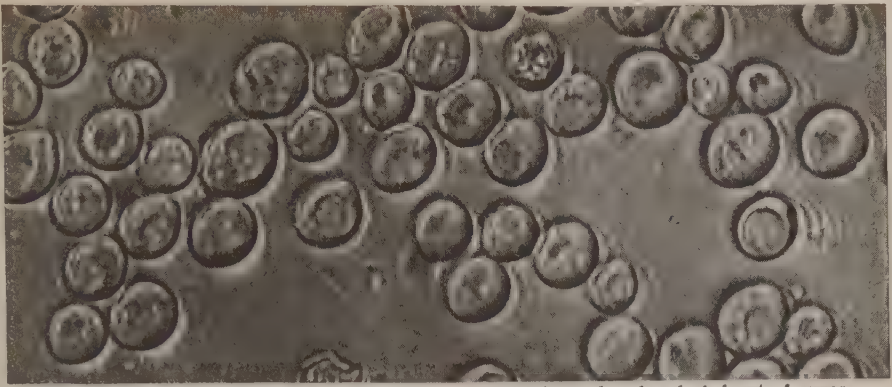
This picture—the arrest of Mayor Dyre on account of taxation—shows Broadway in 1681. About where the negro servants are peering from the gate Liberty Street now crosses; and the cross-street beyond, where the sheep are, is Wall Street. Trinity Churchyard lies just to the right of the cattle passing the pump.

Original in possession of the Title Guarantee and Trust Company.



Reproduced by courtesy of the Long Island Historical Society.

In 1664 New Amsterdam became New York when it passed under England's control; but the buildings in these pictures were Dutch. The lower view shows the "stadt huys" (state house) in 1679, at the corner of Pearl Street and Coentijs Slip. This was then the water front, with the East River bordering the street, although it is now several blocks away.



Magnified yeast cells, which breathe, digest and multiply, and make alcohol out of sugar.

OUR UNSEEN FRIENDS AND FOES

CONTINUED FROM 439

DIFFERENT kinds of microbes have different powers. Some act in useful, some in harmful ways. Some microbes, for instance, have special powers of making food material with the aid of the air which is found down in the soil. Air contains a very valuable element called nitrogen, which ordinary plants cannot use, and which we cannot use, though we breathe it into our blood along with the oxygen which we *do* use. But certain microbes can take this nitrogen and combine it with other elements so as to make compounds which are perfect food materials.

These particular microbes are specially fond of certain kinds of green plants. The farmer knows that it is worth his while to grow these plants one year so as to make the soil rich in food for his wheat the next year. If he grows wheat every year, the soil will become exhausted of its food materials, and so farmers have long practiced what is called the "rotation of crops." It is, of course, a very serious matter, for the farmer and for the country, that the farmer cannot grow wheat every year; but it is hoped that by using these special microbes in a particular way we may be able to grow wheat year after year in the same soil.

The dairyman should be as much interested in microbes as the farmer, for they are of the utmost importance in all his work. Among them are included his best friends and his most dangerous enemies. If we realize that microbes are everywhere, we shall understand that they invade milk from the moment it is drawn—microbes of all kinds, useful and dangerous, from the air, from dust and from water.

Milk is one of the best things in the world in which to grow microbes, and so those which get into it grow very quickly, for good or for evil. It is the duty of the dairyman to keep out of his milk all dangerous microbes. It is the duty of everyone to know that milk, which is a perfect food for us, is also a perfect food for some of our most terrible enemies, such as the microbe that causes tuberculosis and the microbe that kills tens of thousands of little babies every summer.

But here we are talking especially about the natural and proper work of microbes. There are quite a number of them which are, in a sense, natural in milk and are known as milk microbes. They are certain to enter it, and are indeed very useful in it. These microbes exist in enormous numbers in cowsheds, and get into milk soon after it is drawn.

The extraordinary thing about this is that as they grow and multiply in the milk they prevent other microbes which might be bad for us from growing there. In the course of time they turn the milk sour, but sour milk is not bad for us. Indeed, the microbes in sour milk, when they enter our bodies, help to protect us from other microbes which might do us harm. So they are really very good friends of ours, and nowadays when people suffer from certain kinds of illness, they are sometimes given sour milk to make them better. The microbes in sour milk help us to digest our food, and they prevent other microbes which would hurt us from multiplying in our food after we have swallowed it.

But there is more to say than this. From milk we get cream, and from cream we get butter; but without the proper microbes of milk no butter could be made. It is the milk microbes that cause the cream to ripen so that butter can be made from it.

THE MICROBES THAT HELP US TO MAKE BUTTER AND CHEESE

The flavor of different kinds of butter depends on the particular kind of microbe that ripened the cream from which the butter was made. Nowadays we can cultivate just those kinds of microbes that help us to make butter with the kind of flavor people like. As the microbes start the process of butter-making, they are called "starters," and in some parts of the world men of science supply the best kind of "starters" to farmers to ripen their cream with.

Just as we could not have butter without microbes, so we could not have cheese. All cheese, of course, is really made from milk, and the milk produced by any particular kind of animal such as the cow is the same all the world over. Yet there are dozens of kinds of cheese, and their differences depend largely on the particular kind of microbe that is used in their manufacture.

Shoes are made of leather, and all leather is made from the skins of animals by a process called tanning. Certain kinds of leather could not be made without microbes. Nor is this all. Every great city has to deal with the problem of how to dispose of its waste matter, and one of the best ways of dealing with sewage is by using microbes to do the work. They destroy those things which are unpleasant and which would do us harm.

We see now that the tiniest of all living creatures play a great part in the world. Especially marvelous is the way, as we have already read, in which they destroy all dead creatures—animal, vegetable, and even human—so as to make room for those that are now living and those that yet shall be; and, more than that, turn the stuff of which these millions of dead bodies are made into fresh and wholesome food material to nourish the life of the earth.

THE MICROBES OF THE PAST THAT LEARNED A LESSON

But we must be quite fair, of course, in talking about microbes. There are a certain number of microbes that live, not on dead matter, but in and upon the bodies of creatures that are still alive. Probably all microbes began by living on dead matter, but some of them learned how to attack the bodies of very old or nearly dying plants or animals, and so at last there were produced the present race of microbes which invade the living bodies of higher creatures and are a scourge and a menace to mankind.

Plants and animals and men may all suffer in this respect; but it is very interesting for us to learn that when creatures live wild, in their natural state in the open air of heaven, and in the light, they suffer little from microbes.

Wild animals and wild plants do not seem to suffer very much. But when man takes various kinds of plants for his own purposes and grows them in conditions which are not really natural, they are often attacked by microbes; and it is the same with domesticated animals.

MICROBES MORE DESTRUCTIVE THAN SNAKES AND TIGERS

This is a lesson for us. If wild creatures were meant to live in fresh air with the sky as the roof over their heads, so also were men and women; and if we shut ourselves up, as we sometimes shut up cows and tigers, microbes will attack us, just as they attack them. The kinds of microbes that are useful to us, such as those that keep the earth sweet, those that help plants to grow, and so on, can thrive in the open air. The dangerous microbes, and especially the microbe of tuberculosis—which kills far more human beings every day than all the snakes and tigers in the world kill in a year—are themselves killed by open air and sunlight.

There are houses in our great cities, and even in smaller places, with windows made so that they cannot open. There are thousands of rooms with no windows at all, lighted artificially all day. No human being should live in such a room. Microbes are almost certain to attack him and kill him. It should be a crime to make a room like that.

THE FRESH AIR SAVES MONKEYS FROM TUBERCULOSIS

We cannot do without air and sunlight; we must not be packed too closely together; and if we obey these laws, microbes will scarcely injure us. If we can save the monkeys at the zoo from the microbes of tuberculosis by keeping them in fresh air, we can also save one another in the same way.

One of the most important of these microbes is not usually called a microbe, but it might well be so called, for it is a close relative of microbes and lives in the same fashion. This is the yeast plant, which turns sugar into alcohol and the gas called carbon dioxid. We use it every day in making bread. The alcohol is blown away as a gas, and the carbon dioxid forms and makes the bread rise.

But we also use the yeast plant to get the alcohol that it makes. This also is a very useful substance; it is used in hundreds of arts and industries; it is splendid for cleaning things and for preserving them; it burns beautifully and makes a splendid fuel; it is perhaps the cheapest and most easily made of all fuels for many purposes. It is cheaper than gasoline, and one day will be used to drive motor cars when we get the right type of engine. So, if we had the sense to know how to use alcohol in useful ways, the tiny yeast plant which produces it would be among the best friends of man.

ALCOHOL A POISON FOR ALL LIVING CREATURES

But men drink alcohol, which is a poison to all living creatures without exception—men or animals or plants. It is even a poison to the yeast plant that makes it, and when the amount of alcohol in the sugar which the yeast plant is feeding upon and changing rises to a fixed point, the yeast plant is killed, and if the process is to go on, the alcohol has to be taken away as fast as it is made. Alcohol is of no use to our bodies, but in time will cause disease in every part of them, especially the brain, which is the most important part of us. It is the great friend and ally of the microbe of tuberculosis, for which it prepares the way by making our bodies unable to resist it.

In various ways, even when taken in moderation, alcohol reduces our power of fighting the deadly microbe. For it diminishes the vigor of activity of the white blood-cells which are the soldiers and scavengers of the body; it diminishes the power of the digestion and is apt to cause inflammation of the membrane of the stomach; and it damages the delicate nerve tissues.

We can usually find the microbe of tuberculosis in abundance in saloons where saloons are allowed to exist. Many people who suffer from tuberculosis spend much of their time in such places, and there the microbe attacks new people who are made ready for it by alcohol. If they spent their leisure in playing games or taking long walks, they would not be in such danger.

TUBERCULOSIS THAT SLAYS THOUSANDS OF PEOPLE EVERY YEAR

The microbe of tuberculosis was found in the last half of the nineteenth century by a great German called Koch, who took up the work of the Frenchman Pasteur—the first man to understand and tell us about microbes. Thousands of people are killed by the microbe of tuberculosis every year. All over the world, wherever men are crowded together, this microbe destroys them. We help to fight tuberculosis by attacking its friend alcohol.

Probably the microbe of tuberculosis is one of those microbes that can scarcely live at all except in the bodies of other living creatures such as ourselves; and so, when we prevent it from attacking us, it will no doubt die out altogether.

There are other harmful microbes. Some, like the microbe of tuberculosis, attack the lungs. Some, as that which causes typhoid fever, must be swallowed before they do harm. Others hurt us only when they get through the skin and enter the blood-stream. If we are healthy and strong, our bodies may be able to fight these enemies. We can also do something by keeping the skin clean and by being careful in eating and drinking.

But let us not forget that, though some microbes do us harm if we let them, and though some microbes kill us, yet without certain kinds of microbes we could not live at all. Life upon the earth depends upon these tiny creatures.

THE NEXT STORY OF OUR OWN LIFE IS ON PAGE 661.

FUJI-YAMA, THE SACRED MOUNTAIN OF JAPAN

© [illegible]

The [illegible] cone of the snow-capped volcano of Fuji-yama, "the Sentinel of Japan," as Kipling calls it, [illegible] [illegible] by surrounding hills. It is [illegible] miles from Tokyo [illegible] [illegible] of the most [illegible] near the capital of Yokohama, and it can be seen from a great distance out at sea.

© Ewing Galloway, New York
Yokohama, which had grown in half a century from a fishing village to one of the most important commercial centres in the Far East, is shown here as it looked before the earthquake of 1923.

JAPAN AND KOREA

CONTINUED FROM 436

First Emperor of New Japan.

OFF the western shores of the great Eurasian continent—that is, the continent formed of Europe and Asia—lies the group of islands which form the British Isles. Off its opposite eastern shores, halfway round the world, lies another group of islands, a long chain of them, stretching from the tip of the huge, bare peninsula of Kamchatka to the tropical, half-civilized island of Formosa, off the coast of central China. These islands form the Empire of Japan, more than three times as large as its counterpart of the West.

Japan is often called the Britain of the Pacific, so many are the points in common between the two countries. Both are near enough to the great continent, the one on the west, the other on the east, to be strongly influenced by it; both are far enough away from it to develop a sturdy independence and a definite character of their own, for both have been kept apart from encroaching neighbors by protecting seas.

It is the call of the sea, the inviting readiness of its open paths, the stern discipline it gives to all who venture upon it, that have fashioned the characters of Japanese and British alike; both are nations of sailors and traders.

The Japanese often compare the shape of their country to that of a dragon-fly. Its body consists of the four chief islands that shut in the Sea of Japan; the two long feelers are Sakhalin—half of which belongs to Japan—and the Kurile Islands, which brush Kamchatka. The Lu-chu Islands and Formosa form a fine tail.

The part of the great continent that lies nearest the body of Japan is the peninsula of Korea, which separates the shallow Yellow Sea from the deep Sea of Japan. Korea, the Land of the Morning Calm, is almost as large as Utah, and, like its island neighbor, Japan, has a long history of its own, but not so long as that of China.

What is more beautiful and suggestive of unearthly visions than the sight of the blazing sun rising from the sea, his beams making the waves look like moving, molten gold, and tinting the wide sky above with every delightful and delicate shade of color? The men of China have ever gazed eastward on this glory, and their oldest wise men wrote down in their oldest books wonderful stories of gods and heroes living in the islands hidden in the gorgeous eastern ocean. And so Japan, this

Land of the Rising Sun, came to be looked upon as a mysterious and sacred country, and its people proudly claim descent from the shadowy great ones. The beliefs which grew up round the old picturesque stories led, in course of time, to the national worship of unseen gods and spirits, of ancestors and powers of nature, which still has a strong hold in Japan. This religion is called Shintoism, a word that means "the way of the gods."

THE PEOPLE OF OLD JAPAN WHO WERE EVER DRIVEN BACKWARD BY INVADERS

It is generally thought that the first people, after the cave-dwellers, to settle in Japan were Ainu, who probably crossed over from Siberia; and a delightful change they must have found it in the southern islands, with their pleasant and warm climate and beautiful, fertile country. The climate on the east coast of Japan is tempered by a warm stream from the south, just as the northwest coast of Britain is washed by the warm Gulf Stream from across the Atlantic. The Ainu, however, were ever pushed back from the more desirable parts of the land by new-comers of higher civilization. Some were of Mongol race, like the Chinese, and came from the neighboring continent across the Sea of Japan, from Korea and what is now Russian and Chinese Manchuria.

Other new-comers came floating along the warm, dark stream from southern Asia. These were of Malay race. Waves of these two races came time after time, and they are the true ancestors of the Japanese people, but the Ainu have never been driven right out of the country. There are still some thousands of them in north Japan, living apart from the other people. They are remarkable for their general hairiness.

They are a peaceable people, not caring for progress, but with many good qualities. They gain their living chiefly by fishing and hunting in the dense forests which harbor wild animals and game, in the northern island of Yezo.

A LINE OF EMPERORS THAT HAS RULED FOR MORE THAN 2,500 YEARS

The Japanese keep many festivals; two of the principal ones are February 11 and April 3. On the first of these days they celebrate the accession of their earliest emperor, and on the second the day of his death. His name was Jimmu, and he is said to have lived more than twenty-five centuries ago. The Japanese claim that from him their one dynasty, or family, of emperors has ruled in unbroken succession ever since; but the dates for the first part of this long time are very uncertain. Still, we know that the Japanese were advancing in civilization, and the early independent tribes were passing under the leadership of one dominant tribe centuries before Julius Cæsar "discovered" Britain.

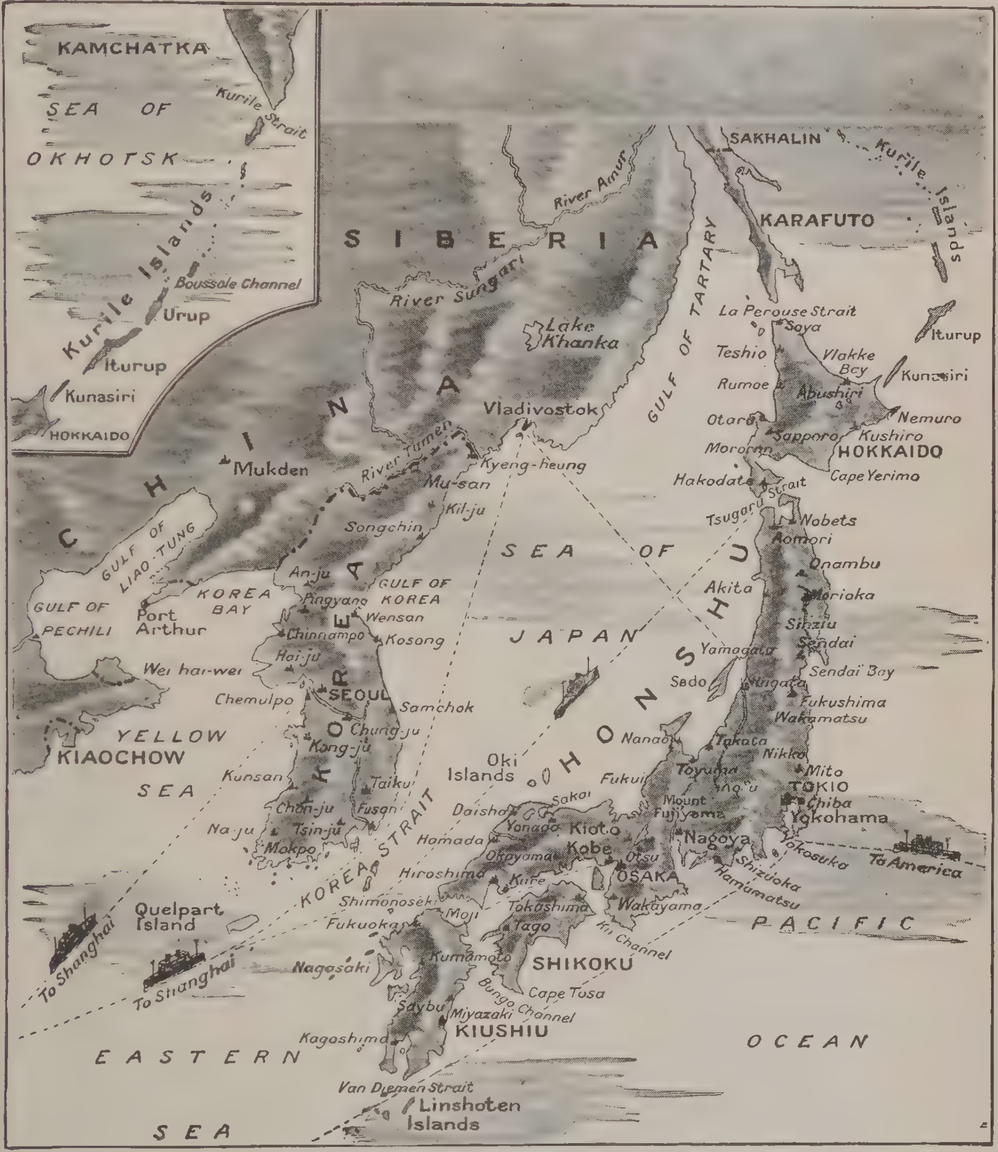
The history of Korea, too, goes very far back. More than a thousand years before Christ there was a migration of the old civilized Chinese into the mountainous peninsula. They ousted the cave-dwellers and formed a cluster of independent states which later united under one rule. A great stream of Chinese and Koreans poured into Japan and merged with its people during the centuries before and after the birth of Christ, and the name of a fabulous great Japanese empress, Jingo, stands out in the third century of the Christian Era as making many conquests in the land of Korea.

HOW THE MIKADO BECAME A SACRED FIGURE, HIDDEN FROM HIS PEOPLE

Nothing is certain about these early stories except that there was much coming and going between the peninsula and the islands. We know that the Japanese, like the Chinese, busied themselves quite early with bringing water to their rice-fields, making canals and developing trade and manufactures. They also, from the first, paid great reverence to their ancestors. By degrees the person of the ruler, the Emperor, or Mikado, became sacred and unapproachable to the mass of the people, as we have seen was the case in China.

It was about the sixth century, when the Angles and Saxons were settling in their new homes in Britain, that the religion of Buddha spread into Japan by way of China and Korea. Eventually it took its place side by side with the older national religion of Shintoism, not driving it out, but supplementing it, as it were; and beautiful Buddhist temples, as well as Shinto shrines, rose up over the country.

Troublous times followed. There were many grades, or different kinds, of nobility all fighting to be first, and many officers and ministers, into whose hands the real government of the kingdom passed as the Mikado became more



THE ISLAND EMPIRE OF JAPAN

and more a mere puppet in a gilded prison, his person sacred and invisible except to the highest officials. The head of the acting government for 700 years was the Shogun. Yoritomo, the first Shogun, was a great general and organizer. He died in the year 1198. The last Shogun gave up his power in 1868.

During the rule of the Shoguns quarrels between great rival families were fought out in pitched battles; nobles lived in their strong castles, surrounded by armed retainers called *samurai*, who were bound to provide forces in the times of national danger. Toward the end of the thirteenth century, when Kublai Khan, the Mongol emperor of China, sent a great host of Chinese and Koreans to invade Japan, it was destroyed by a storm.

We remember how Marco Polo was persuaded to write a book about his wonderful travels. In it he introduced Japan to Europe, thereby greatly exciting and interesting his readers. He called it Cipango and said it "is a large island toward the east of China, in the high seas. And a very great island it is. The people are white, civilized and well favored. They are idolaters, dependent on nobody. And I can tell you," continues Marco, with many more interesting details, "the gold they have is endless, for they find it in their own lands."

In the map used by Columbus, two centuries later, this rich island was drawn large on the east of Asia, with no American continent between it and Europe. As to Korea, so little was known about it in the West in those days that the old map-makers had recourse to a favorite device of theirs to cover deficiencies of knowledge: they drew an elephant to fill in gaps.

THE ANCIENT PIRATES OF JAPAN, WHO SAILED THEIR JUNKS TO AMERICA

In those days, when men were reaching out to find each other and to discover new countries all over the world, there were pirates on every sea. The Japanese were not behind in daring acts, and their junks faced the seas fearlessly, passing to Siam, to India, and possibly reached Mexico.

It was not long after the death of Columbus that the Portuguese found by an eastward route what he had tried in vain to find by sailing westward. From the rich Indies they passed to China and thence to Japan. Christian missionaries soon followed the traders and explorers. The famous Jesuit, Francis Xavier, arriving in the year 1549, managed to get a footing in the southern island of Kiushiu, and conducted, under difficulties, a short but brilliant mission. He says in his letters home that the Japanese "are wonderfully inclined to see all that is good, and have an eagerness to learn."

Toward the end of the sixteenth century Nagasaki, the chief southern port, with its fine harbor, where the largest Portuguese ships could ride at anchor, became a Christian city. Christian churches were built on the sites of old Buddhist temples; but the progress of the new religion was stopped before long. A great soldier of fortune, Hideyoshi, rose to the highest power. He is often called the Napoleon of Japan, so great were his victories. He conquered Korea and even planned the invasion of the Chinese Empire.

A GENERAL WHOSE DESCENDANTS RULED JAPAN FOR 250 YEARS

His successor, also a great general, overthrew all his rivals and founded a dynasty of Shoguns that ruled a united Japan in peace for 250 years. To secure this peace, the Catholic missions and the foreign traders were sent away, and the country was closed to all but the Dutch; under narrow limits they alone were allowed to trade at Nagasaki. Some of the most beautiful Japanese work is to be seen at The Hague, gifts from the Mikados of those days. Very little about Japan was known in England during the reigns of the Stuarts and the Hanoverians.

It was in the middle of the last century that there came a great and wonderful change. Japan had gone on all those peaceful years making improvements in the produce of the country, in the fields, in the tea gardens, in the hand looms, in the pottery factories and in many other arts in which the people are so clever and tasteful. But discontent was smoldering, and a longing to expand was growing in the hearts of the people.

When the bold Commodore Perry arrived with a United States fleet to insist on pulling down the barriers which had kept Japan away so long from the rest of the world, the old system seemed to fall at a blow. Treaties with various powers were signed, Yokohama was opened to foreign trade, the Shogun had to retire with all his old-fashioned ideas and ways, and the Mikado was restored to the full and ancient powers of his office and reigned over the people in fact as well as in name.

JAPAN'S GREAT LEAP FROM THE SLEEP OF CENTURIES INTO THE LIFE OF TO-DAY

It makes us almost breathless to read of the rapid changes that have taken place in Japan during the last seventy years. Once in contact with the West, there were no half-measures. The old feudal ways were swept away in most dramatic fashion as Japan leaped out of the Middle Ages into the full stream of modern life with its newest inventions and movements. Students were sent to Europe and America to gain Western knowledge. European and American instructors were brought to the country,

PEOPLE OF JAPAN, INDOORS AND OUT

A Japanese girl of a certain class is often seen with a gaily-colored umbrella, which she carries so daintily.

The jinriksha is the carriage of Japan in which ladies go visiting and the riksha men can travel very rapidly.

A poor family at dinner. The Japanese sits on the floor and carries the food to his mouth with chopsticks.

Here are some girls taking dinner together. The chopsticks used are very much like our lead pencils.

The girl sitting down is writing a letter. The pen is a fine brush and the ink is a stick of India ink.

The lady on the right is receiving a visit from her friend, and this is how they greet one another.

and roads were improved and bridges built; railways, telegraphs and telephones were started all over the country. Banks, warehouses, mills and factories rose up quickly; law courts were established as well as a constitution granted, in 1889, which gave a House of Representatives elected by the people.

Education on modern Western lines has been started everywhere; Western fashions in dress and manners have been largely adopted. A splendidly efficient navy and army have been created. They were needed, for, besides all the astounding upheaval and amount of work and expense involved in all the home changes, Japan has had to face two wars with its opposite neighbors. The first, with China, was in 1894 and 1895. Six months decided the contest. The island of Formosa was added to the Mikado's empire, and the world saw that a new power had arisen to help to shape the destiny of the Far East.

JAPAN'S VICTORIOUS STRUGGLE WITH THE GREAT POWER OF RUSSIA

Japan joined the European powers in the relief of Peking at the time of the Boxer Rebellion, and four years later found herself in the throes of a contest with Russia. The losses and suffering were very great on both sides, but the Japanese were everywhere victorious. They won the great battle of Mukden, destroyed the Russian fleets one after the other, and captured Port Arthur. Finally, at President Roosevelt's mediation, the two nations made peace, and a treaty between them was signed at Portsmouth, New Hampshire, in August, 1905.

Every Japanese boy is brought up to believe that the greatest honor that can befall him is to die for his emperor and country, if need be, and so it is no wonder that the flag of the Rising Sun was carried triumphantly from start to finish. Japan gained half the island of Sakhalin by this war, and established a sort of protectorate in Korea. In 1910 the Japanese Government took entire charge, and Japanese officials manage the railways, the post offices and many other matters of great importance to the country.

In 1914 Japan, as an ally of Great Britain, immediately declared war against the German Empire, and soon captured the strong German fortress of Kiaochow in Shantung, China. The Japanese fleet took over some German islands, and also searched the seas for German commerce destroyers. In addition to this, Japanese troops went to Siberia to protect the interests of the Allies there. At the close of the war Japan succeeded to German rights in China; but in December, 1923, Kiaochow was given back to China, and Japan withdrew, in accordance with a treaty signed at the Washington Conference early in the year.

A DESERTED PALACE IN THE ANCIENT COUNTRY OF KOREA

Taking steamer from Nagasaki, we can visit the ancient country of Korea, delightful in spring and autumn, which has for centuries been so connected with both China and Japan. There is a railway from its chief port, Chemulpo, to the capital, Seul, which is shut in by a wall and eight gateways, like Peking on a small scale. There are many interesting buildings, a marble pagoda and a bell tower, temples and tombs. The saddest sight is the vast deserted palace—deserted because the Korean empress was killed there in the course of the war.

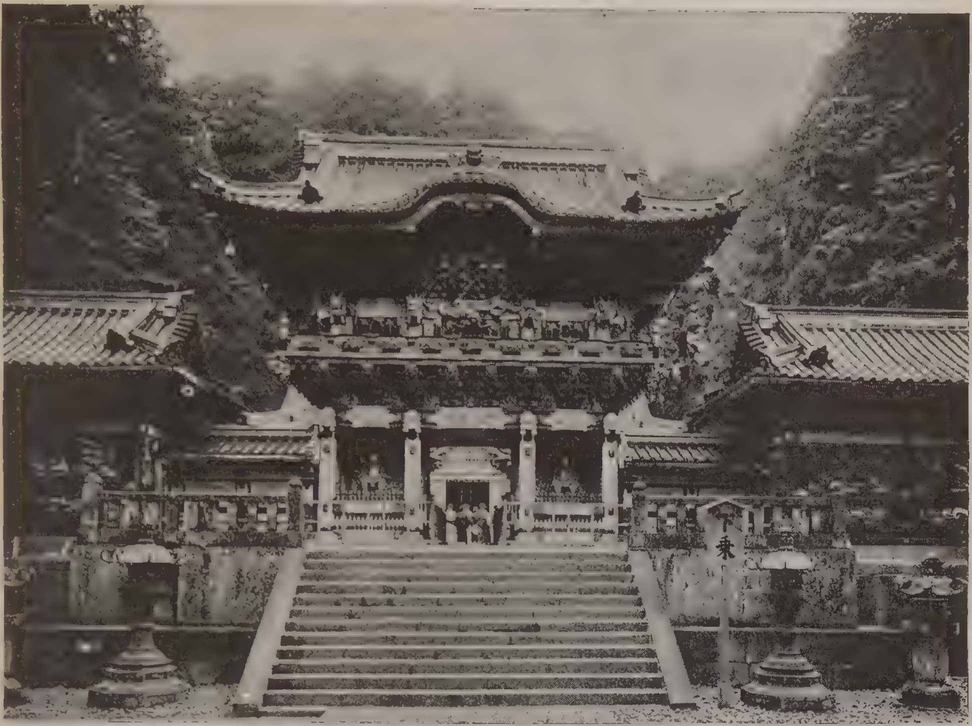
The Korean people are poor and spiritless, and for long paid tribute to their powerful neighbors to let them alone. The valleys are very fertile, and crops of various kinds are raised. There are large forests, and the metals are believed to be very abundant; but there is still much to do in developing the resources of the country.

It would need a Japanese to describe with justice the land whose beauty has so much to do with the fervent patriotism and perfect taste in art of its people. We must think of all we have seen most beautiful in our own country and put it all together, and then it falls short of what we can see in Japan. For the lovely scenery of this part of the world is set off, as it were, with a garment of most gorgeous and wonderful coloring, made of blossoms of every hue.

JAPAN, THE LAND OF DAZZLING BLOSSOMS AND FAIRY LANDSCAPES

Public holidays are set apart for people to go out to admire the fruit trees in flower—cherry and plum and peach blossoms. Men travel miles to visit the great fields of irises and lilies, all most delightful to the eye. Many of our favorite flowers have come to us from Japan; but there the purple wistaria hangs in profusion over great trellises,

GLOWING SHRINES ON NIKKO'S WOODED HILLS



THE GATE OF THE TWO KINGS, ADORNED WITH CARVEN FIGURES OF STRANGE BEASTS

THE AVENUE OF STATELY CRYPTOMERIA TREES LEADING AWAY TOWARD TOKIO

On the hills of Nikko ("Sun's Brightness"), among groves of lofty cryptomerias and other trees, stand the tombs and shrines of two shoguns, dead 300 years. The brilliant structures glow with gilding, vermillion and lacquer.

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the camellia trees grow as high as a house, and the masses of roses, convolvulus and azaleas form dazzling banks of color. The tall bamboos, so useful as well as ornamental, and high, feathery grasses, graceful pine trees and lacquer trees, all help to make up the real fairy landscapes of which we get hints on the screens and fans and embroideries that have been worked and painted by those who live within sight of these beauties of nature.

We can perhaps match most of the fine mountains and the leaping, foaming waterfalls, the rich plains and valleys and the short rivers that water them—the longest Japanese river is shorter than most of ours. But we have nothing to put beside the mysterious wonder of Fuji-yama, the sacred mountain so deeply beloved by the Japanese and pictured by hundreds of their artists. It rises, solemn and lonely and grand, in a beautiful cone-like shape two and a third miles above the plain, and it is more than a hundred miles round its base.

FUJI-YAMA, THE FAMOUS JAPANESE MOUNTAIN OVER TWO MILES HIGH

The mountain is near the sea, and not far from the capital of the empire, Tokio. Rudyard Kipling calls it "the keynote of Japan," so great is its impressiveness as one enters the bay, especially if its top is covered with snow. Sometimes the shroud of white drops to the base; but after the thaws of August and September only stray patches are left over for another year.

Even with the help of coolies it takes hours to climb up the long slope over any of the five paths which have been worn by the feet of pilgrims and tourists; but what a view from the top! Over fertile plains and glinting water to mountains beyond. This climb up more than two miles into the air gives us an idea of the changes in vegetation that would be seen in traveling thousands of miles toward one of the earth's Poles. About the base lies a band of cultivated land where grow the crops that belong to warm regions—barley, beans, peas, tea, cotton; the next belt is a grassy stretch of moorland and steppes; then comes a great ring of forest trees, which dwindle in height as they approach the peak until the upper border is a low, stunted growth; above this the climate is about the same as that of the tundra, or frozen bogland, but the top of the mountain is covered with a mass of old lava and ash. The drowsy giant still breathes out a little jet of steam.

From the heights of Fuji-yama we can see another great mountain, the active volcano Asama-yama. Japan's islands, which were formed by volcanic force, have probably as many as 170 volcanoes upon them. Most of these, of course, are not active now, but some of them break out after being quiet for years and years. One is said to have become violent after 130 years of sleep.

You can see why Japan has been spoken of as a "precarious country." Every year there are many earthquakes. Though most of them are not very severe, perhaps as often as every ten, fifteen or twenty years there is a serious disaster. The greatest of all catastrophes caused by disturbed conditions of nature since history began fell upon Japan in 1923. A little before midday on the first of September the cities of Tokio and Yokohama and a broad region around, covering a radius of about fifty miles from Tokio, began to shake up and down with fearful convulsions of the earth. Great sections of Yokohama and Tokio, as well as parts of several other cities, were shattered into splintered and crumpled wreckage within two or three moments. Falling buildings, collapsing bridges, bursting oil tanks and snapping gas pipes made a horrible confusion, close upon which came fearful danger from fire. The water mains had broken and there was little means of fighting the flames to hold them back. The earth continued to shake, though with less violence. Indeed, within the following week as many as 1,319 shocks were counted. The folding of the earth's crust somewhere under the ocean may have caused this shaking and cracking along the coast. The sea itself rolled up in tidal waves, and typhoons completed the wild sweep of destruction.

Just how many persons lost their lives can never be known, but it is probable that there were at least 200,000. Among them were princes, princesses and ministers of the government. Thousands upon thousands of men, women and children were injured, besides, and hosts of refugees suffered from lack of water and food. It is interesting to know that news of the calamity and appeals for help

THE TEMPLES AND IDOLS OF JAPAN

Shintoism means respect for ancestors or heroes. Here is the entrance to a very famous Shinto temple.

The mass of the Japanese are Buddhists. This is the interior of the Ikagame temple, one of the finest in Japan.

Japan is a land of giant idols. This strange bronze Buddha with its great halo is to be seen at Hiogo.

This bronze image of Buddha is 50 feet high and nearly 100 feet round. It was cast at Kamakura in 1252.

Here is another striking image of Buddha that forms one of a pair of bronze figures at a Tokio temple.

This is a Buddhist prayer-shop. The prayers are on paper, and are offered by being thrown to the winds.

These stone figures of Buddha at Nikko are very ancient. In 1902 a flood carried away some of them.

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were sent out first from wireless stations, which had been so wisely placed that they were not destroyed by the tremors. Relief work began at once with the removal of as many as possible on board the ships that were at hand. Railroads were useless for a while, because tracks had been bent into impossible curves and many cars burned. A new prime minister who had just taken office gathered his cabinet together for the first time around a table out-of-doors, and their first work was to lay plans for relief. The government at once donated a large sum for rice. Great quantities of rice were hurried to the shattered regions to be distributed among the hungry, homeless folk, who waited hours at a time to obtain this food. Generous gifts of money and provisions went rushing over the ocean from the United States and Europe for the comforting of destitute Japanese.

JAPAN'S LOSS FROM THE WORST EARTHQUAKE DISASTER ON RECORD

The money loss to the country was greater than the cost of its war with Russia, and in Tokio alone nearly 400,000 houses were demolished. At first the inhabitants gathered with their pitiful bundles of possessions in open spaces anywhere, or they sought protection in the great iron flues of overthrown factories and other strange shelters. About 2,000,000 were left homeless.

We are all familiar with the low-roofed, lightly built frame structures of Japan, planned to withstand the dangers of earthquake; but in this supreme test the buildings which came through shock and fire with little damage were of modern American steel and concrete construction. It is said that much wealth was saved by being stored in modern safe-deposit vaults. Plans were promptly made for rebuilding the wrecked cities and restoring business that had been so roughly interrupted. Government and people met the terrible experience with superb patience and courage.

Japan has a great number of large towns, several with tens and hundreds of thousands of inhabitants. Tokio, the capital, is on the largest island, Nippon, or Honshiu. Before the earthquake it had a population of over 5,000,000.

The temples and tombs of the Shoguns have long been one of the great sights of this picturesque city, with its avenues of cherry trees. The Imperial Palace is here, too, with its crystal chambers and beautiful ceilings and brocades. Happily it escaped destruction in the vast upheaval. In November thousands of people congregate to see the magnificent chrysanthemum shows. The flowers are much larger and more beautiful than those seen in most gardens of other countries. The distances are so long in the chief cities that jinrikshas, such as we have seen at expositions, are greatly in request. Coolies, or laborers, run them swiftly about, even on the country roads.

Yokohama, the port of Tokio, was, at the time of the earthquake, one of the world's great trade centres. At Kamakura, near by, is the tomb of Yoritomo, the first Shogun, and also an immense bronze image of Buddha, one of the greatest of Japanese works of art. It is nearly fifty feet high and leaves a wonderful impression of peace and majesty on the mind. After the earthquake, shifted from its ancient seat, it looked out over a plain of ashes.

The Japanese have a proverb: "Do not use the word 'magnificent' till you have seen Nikko." Besides being a most beautiful town, this includes a whole mountain district, about 2,000 feet above the sea. Natural beauties of thick vegetation and water leaping in cascades rival the interest of splendid Buddhist temples and tombs of Shoguns and saints. One waterfall, Splendor of the Sun, has a drop of 350 feet.

THE HARBOR CITY THAT HAS ALWAYS LINKED JAPAN WITH THE WEST

The island of Kiushiu, on which Nagasaki, with its landlocked harbor and granite docks, is situated, has played a large part in the country's story. Legend has it that from here Jimmu and Jingo set forth on their heroic expeditions. Upon this island the Portuguese traders and missionaries landed and European civilization was first made known to the Japanese. During the time that Japan was closed it was Nagasaki that was the only port opened to the West.

Since the door has been flung wide open, Kobe, on the beautiful inland sea, has grown from a fishing village into a large and bright city, where most of the home trade is carried on, and foreign firms are well represented. With the sudden crippling of Yokohama in 1923, Kobe had to do greatly increased ser-

JAPANESE WORKERS AT THEIR DAILY TOIL

The Japanese are a very artistic race, and their metal-workers, seen here, produce very beautiful objects.

Here we see workers making large metal wares. When beating the metal into shape they use their feet.

Rice is the chief article of food in Japan, and here we see the rice being cleaned in a primitive machine.

In Japan everybody works, and here we see a family returning after the day's labor on the farm is ended.

In making and coloring dainty vases the Japanese excel, and here we see the pottery artists at work.

In this picture we see pottery being packed for Europe. Thousands of dollars' worth are sent to us every year.

vice in foreign trade. We can take the train along the lovely shores of this Mediterranean of Japan between Honshiu and Shikoku, the smaller southern island; or, better still, pass on our way from Nagasaki in a steamer through the deep, clear, blue water from end to end, passing countless islands and hills clothed in vivid green; and there is ever the living interest of the numerous fishing boats and curious-looking junks and tiny villages hidden in unexpected nooks.

Osaka is another manufacturing centre near the inland sea, and is renowned for its beautiful temple and fine bazaars. By Osaka flows the river that drains Lake Biwa, the largest lake in Japan, about the size of Lake Geneva, and, like it, very beautiful. It is delightful on a warm summer night to watch the crowds of people enjoying the pleasures of boating, the music on the water, and the dancing light from thousands of lanterns. Refreshments are taken in tea houses, of which there are many on the shores of the lake.

From Osaka we can take the train to Kioto, an old capital of Japan, famous for its wonderful architecture and interesting memories. The Mikado's old palace here covers many acres of ground.

THE WORKERS IN THE CITIES AND THE WORKERS IN THE FIELDS

In these and other great towns we find many of Japan's millions of inhabitants. Many, too, are engaged in the fields, for agriculture is actively carried on in Japan, as in China. Thousands are employed in the fisheries on the seas, lakes and rivers, for fish is very plentiful and is one of the chief articles of food. Tall, smoky chimneys are rapidly rising in many industrial centres in Japan, but the work which is of greatest beauty, and which has had greatest influence on the taste of the West, has been from time immemorial the patient, delicate handwork of men and women who are born artists.

Tea-growing and silk-weaving were introduced from China many hundreds of years ago. Porcelain made from kaolin, a fine white clay, is of world renown; carpets, baskets, beautiful lacquer work, every variety of fans and lanterns, and endless things for both ornament and use are made in Japan.

Unfortunately, we see too few of the really valuable Japanese articles in the West, while we have great numbers of poor imitations made in our own factories; but if we study the treasures in good shops and museums we can gain much help in our efforts to know the interesting and artistic work of Japan.

HOW WE HAVE COPIED JAPAN'S DRESS AND JAPAN HAS COPIED OURS

Western dress has been adopted at court and in the army and navy, and in many circles; but the kimono, so familiar to us in our bedroom négligée and in the musical play Mikado, is still the distinctive garment of the country. Made in gorgeous embroidered silks and satins for the rich, and in the very simple materials for the poor, it is worn with a broad sash, which keeps all tidy, and serves, with the deep kimono sleeves, instead of pockets.

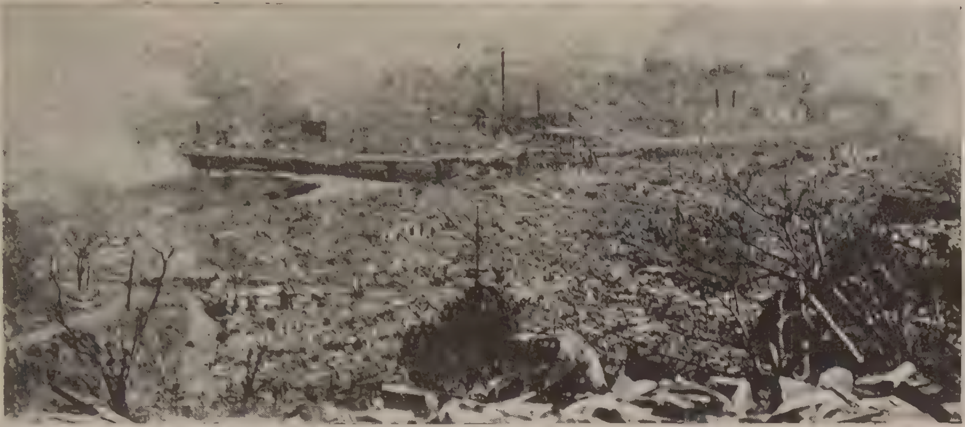
Japanese footwear is quite different from ours. There is a thick white sock, with a division for the great toe, worn with the shoe or clog. The shoes are taken off on entering a house, so as not to soil the mats upon which the cushions used as seats are placed, for a Japanese house has little furniture. Often the greater part of the house is made of wood with windows of tough paper, and the partition walls are simply sliding doors. Paper serves for umbrellas and waterproofs, and a cloak made of thatch is often used by farmers and fishermen.

The beds are made of thick quilts laid on the floor, with wooden pillows, all being moved away in the daytime. Everything in a Japanese home is most tastefully arranged so as to give pleasure to the eye, and all is spotlessly clean.

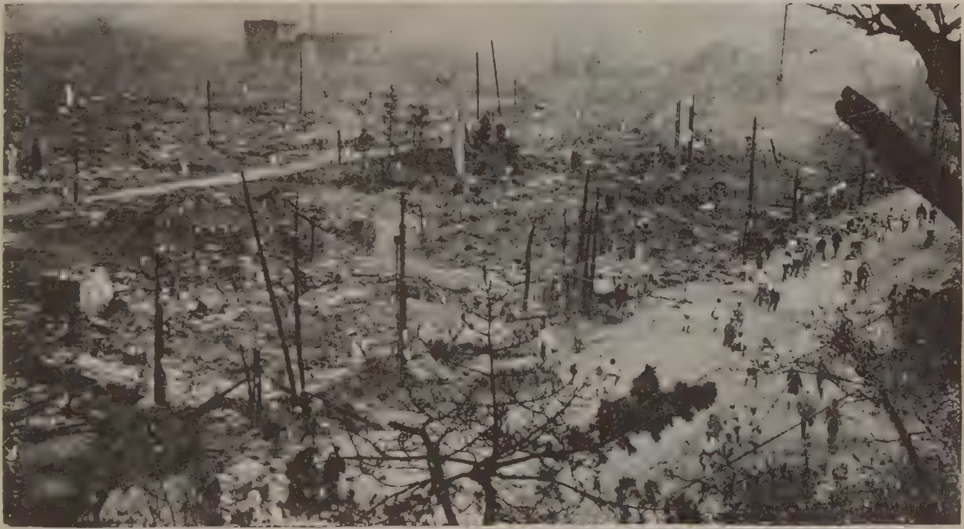
In ceremony and the forms of politeness the people of Japan can hardly be outdone. Their greetings and salutations, their apologies and requests breathe extreme humility on the part of the speaker and unbounded admiration of the one addressed. By low bows and courteous gestures they indicate deference to your wishes. A very high-born person might invite you to honor with your "exalted presence" his "miserable, disreputable, unworthy dwelling," or to "hang your honorable bones" upon his "dishonorable seat." Yet this would be only the accepted language of highly ceremonious custom in Japan.

Perhaps Japanese children have a hap-

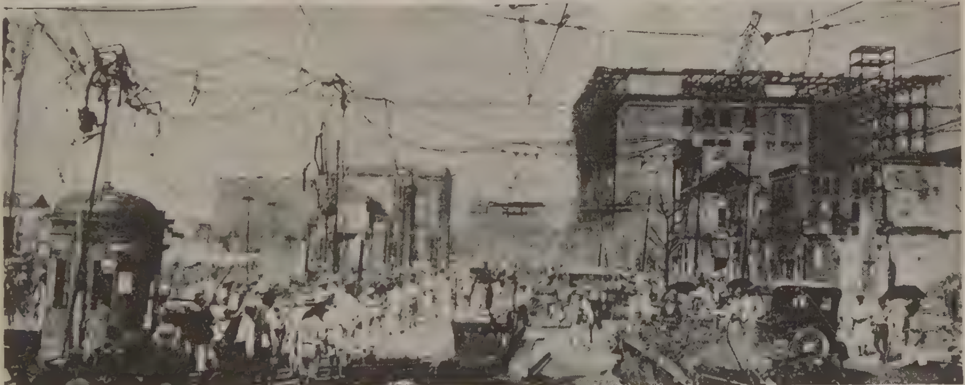
TWO CITIES SHATTERED BY EARTHQUAKE



This view from the cliff shows Yokohama after the earthquake had shaken the seaport into jumbled fragments and started fires in several sections. Boats in the harbor rescued many who had fled from the ruins.



The business centre of Tokio as it lay when the smoke clouds had rolled back, disclosing the havoc that had fallen upon the capital city. On the roadway you can see refugees carrying what they had saved.



This view shows Ginza Avenue, Tokio, when the tremors of the earth and the fury of the flames had passed over it. Beyond the remnants of street cars and automobiles and the twisted tangle of wires you can see foreign-built steel and concrete buildings which withstood the shock. Wide World Photos.

pier time than any other children in the world. Their fathers and mothers are devoted to them, and train them from babyhood to be self-controlled and polite to everyone, to be gentle in their ways and to be fond of work. And all this lays the foundation of lifelong happiness. Spoiled, selfish, idle, cross and miserable children are rarely met with in Japan. There are plenty of lessons and plenty of play. And the toys! We all know the delights of Japanese dolls—the children are so like them—and the clever tops and kites, and wonderful model villages. There are many feast-days, specially for the children, when they are all dressed in their best and brightest kimonos and sashes, and look as gay as the flowers and butterflies.

A Korean lady in her sedan chair.

Korean scholars with their teachers.

The Feast of Dolls is for the girls, when the "honorable" dolls and the dolls' houses, so carefully kept from generation to generation, are brought out and enjoyed, and the little ones have presents of dolls and dainty articles for their use. The boys have their turn on the Feast of Flags, when images of soldiers, heroes, wrestlers are bought for them, as well as helmets, flags, bows and arrows. The sham fight, which is a favorite game on this festival, brings to memory the fights of the rival clans in the old feudal days. Kite-flying and top-spinning done in really scientific fashion are grand pastimes, and quite old men join in them with the children.

The dead are never forgotten in Japan. Every summer the Feast of the Dead is celebrated all over the country, with processions, the carrying of fans and banners, and the tombs are illuminated with beautiful lanterns shedding many-colored lights. The end of the feast at Nagasaki is very striking. After midnight thousands of little ships of straw, carrying small offerings of fruit and money and the lighted lanterns from the tombs, are launched on the waters of the bay. As each little craft catches fire, the soul it is supposed to carry is said to have reached again the Unseen Land.

The Japanese make many visits to the temples and shrines, and honor thousands of gods. Very often they make pilgrimages to distant shrines. The pilgrim bound for Fuji-yama can always be distinguished by his white kimono and large straw hat.

Many travelers now go to Japan, for these islands are a central station, so to speak, in a tour round the world, and all admire their scenery and flowers, and their temples, tombs and festivals, which recall the deeply interesting past. But more interesting still is the life and work of to-day in the great cities, and in the widespreading country. The dear, polite babies, the bright young girls, so charming in manner; the swift rikshas whirling past; the shops full of the clever work of the nation; the passing crowds, so clean and docile and orderly—all are sources of continual charm and delight, and seem like part of a moving picture.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 647.

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A decorative mosaic from an old castle in Sicily.

A GREAT LIGHT SHINES

CONTINUED FROM 454

THE dying-out of Classic art left the world cold and bare, and something like ten centuries were to pass before a new glory rose on the ashes of the old. Meanwhile, in an obscure corner of Asia Minor the greatest event of the world's history had taken place—the birth of Jesus at Bethlehem. Let us think of the influence of Bethlehem on the fortunes of those days. It was the shining of a great light for art.

For many generations Christianity had no real home, but was the guest of several countries and states. It was impossible for a people so scattered to have in themselves the masterful power which produced the art of Egypt, Assyria or Greece; it was equally impossible to be neighbors to such greatness without copying it. In early Christian art, therefore, it is natural that certain influences should be traced—Greek, Syrian and, to some extent, Persian.

Alexandria in Egypt was then the centre of Greek painting, and although the Grecian genius was worn out, and its ideals were rather battered, it still had command of technique and was able to give valuable lessons to a new art. Greek painters taught the Christians how to fill spaces and how to group figures and ornament. The secret of great composition—to avoid overcrowding—was still a part of the Greek tradition, but the early Christian artists, like the Romans, failed to learn this lesson. To its dying day the spirit of Greek art was beauty for beauty's sake. A very different purpose underlay Syrian art.

The Syrians were less interested in their painting than in the subjects they portrayed. It was their instinct to represent the gentle Jesus as a haughty figure, tinged with the egotism of the Egyptian and Assyrian art of which the Syrians themselves were heirs. The Founder of their religion was always in a central position and drawn on a larger scale than any other figure. We can always recognize this Eastern influence, so contrary to Greek ideals, when we see pictures by the early Christians painted in what is called *inverted perspective.* The peculiar treatment showed the foreground figures, which should have been larger than the rest, actually smaller, so that the Christ in the middle of the composition might stand out more convincingly. The Syrians, in a word, did not paint pictures as pictures: they merely illustrated an idea in color and shape; their art was the expression of their religious thought.

The Persians, on the other hand, who also had an effect on this new art, were without any sense of perspective whatever. In its place they adopted a curious convention. Their compositions of groups of people show figures always painted in flat tints, with no attempt at modeling, no rendering of a background. And, in order to show that some persons were nearer the front of the picture than others, they painted figures in zones, or layers, one set above another; the highest group in the picture was supposed to be in the farthest background. The Persian influence on early Christian art is shown mainly in this strange un-lifelikeness and in the introduction of a certain kind of ornament—a conventional scroll of vine leaves and branches wherein birds and beasts are most incongruously set.

PICTURES IN THE MEETING-HALLS OF THE FIRST CHRISTIANS

Generally speaking, Christian art of the first few centuries was divided into two branches, that of the Western world, centring in Rome and Ravenna, and that of the Eastern world, centring in Constantinople. The Constantinople school is known as Byzantine, and takes its name from Byzantium, the ancient name for Constantinople, which the Christian emperor Constantine in the fourth century made the new capital of the Roman Empire.

Traces of the work of early Christian artists, gold and enamel objects, and pottery, have been discovered in most of the Mediterranean cities. The chief monument to their art is found in the wall-paintings of the catacombs during the first four centuries. These were burial places, and, in the years of their persecution, the secret meeting-halls of the followers of Jesus. Catacombs were known to exist in Naples, Syracuse, Alexandria, Cyrene and in the Holy Land. The most famous are at Rome, where about fifty have been discovered from time to time.

THE UNDERGROUND GALLERIES WITH THE SECRET ENTRANCES

The Christians, like the Romans, built their catacombs outside the city-wall, on the great high-roads that led from Rome to the outer parts of the empire. Some of them lie in the famous Appian Way; one of these, the catacomb of St. Domitilla, is supposed to be the most ancient.

The catacombs were long narrow underground galleries, with recesses and small chambers breaking their gloomy lines. When, during the bitterest persecution of the Christians, the emperor Diocletian ordered the catacombs to be closed, the worshipers burrowed fresh entrances and made new and mysterious passages whose winding mazes were known only to themselves.

As time went on, the existing catacombs proved in some cases insufficient for needs of burial. The workmen then sank shafts until they found a lower stratum suitable for excavations; when those galleries became over-full of their ghostly burdens another stratum was found, and then another. Visitors can still go from one to another of the four floors of the catacomb of St. Calixtus.

In the walls of the catacombs horizontal rectangular spaces were cut to hold the dead, and these were closed by marble slabs. At a later period it was the habit to place beautifully chiseled stone coffins in these niches. When the "peace of the Church" came with the reign of Constantine, the practice of burying the dead in catacombs ceased. Cemeteries and chapels were made, and the underground galleries and chambers became meeting-places for the cult of martyr-worship which arose. In later centuries the catacombs ceased to have this hold on the Christian community. Then they became merely a dim tradition.

HOW THE CATACOMBS WERE LOST FOR AGES AND FOUND AGAIN

Medieval pilgrims who walked across Europe to Rome, the Eternal City, used to visit a catacomb in the Appian Way, near the little Church of St. Sebastian, but for the most part the ancient burial places were forgotten. Late in the sixteenth century the accidental falling of a vault laid bare some wall-paintings, and these excited the interest of archæologists. Most of the catacombs have since been excavated, and thus a period of remote Christian history of unusual interest comes to light.

In spite of the dim light and most unpleasant and foul air, the chambers and recesses of the catacombs were decorated. Some of the wealthiest families of Rome were Christian, and spared no pains or expense in making beautiful the halls of their dead. The Christian religion had taught them that death is the least misadventure that can befall a man, and thus there was nothing morbid in their interest and devotion to this mural art. Just as in Syrian paintings it seemed that the artists were speaking aloud, saying a tremendous creed about a Great and Jealous I AM, so in the timid, shy art of the catacombs it seemed that the artists were praying aloud and holding communion with their beloved dead in Paradise.

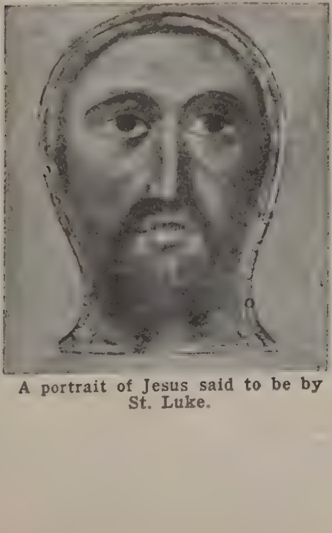
PICTURES ON THE WALLS OF LONG-AGO

A splendid Ravenna mosaic of the sixth century.

St. Michael in an old mosaic.

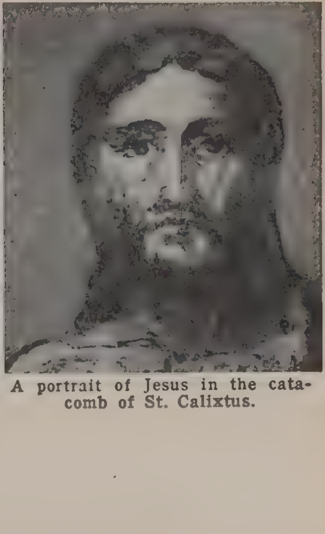
Figures from the wonderful mosaic walls of St. Mark's, Venice.

From a sixth-century mosaic.



A portrait of Jesus said to be by St. Luke.

Pictures on the walls of a catacomb in Rome.



A portrait of Jesus in the catacomb of St. Calixtus.

There is no surprising merit in the paintings of the catacombs; but looking now across a span of about twenty centuries, one can see in those dark underground places the first blossoming of the eternal springtide and hope and Christianity, the spirit of the One who said, "Behold, I make all things new."

This "joyful sorrow" for those who had found a happier home was never far from the thoughts of the Christian artists; and so they painted dainty friezes of peacocks, typifying eternity; trees which meant the garden of Paradise; the turtledove, the picture of the soul at peace; the lyre, signifying the Divine Word. It was the early Christians who inscribed on their tombs that most beautiful phrase *Sit tibi terra levis*—"May the earth rest lightly on thee"—a whole poem in one line.

The Roman catacomb-decoration of the first century was chiefly of this delicate, lyrical kind—symbols, floral designs, vine tendrils. At first only the walls were painted. In the second century the treatment of the figure in design appears, the walls were set apart for subject paintings, and the daintier symbolic work was in a very literal sense skied—reserved for the ceilings of the chambers.

THE FIRST PICTURES IN THE WORLD OF MARY AND JESUS

Some of these ceiling-decorations are a delightful mixture of paganism and Christianity. On the roof of the catacomb of Lucina a delicate geometric pattern appears, with tiny inconspicuous figures fitted into the lines of ornament. Looked at casually, it might seem to be a repeated ornament on a ceiling-paper in our grandmothers' houses; closely examined, it reveals a figure of the Good Shepherd in the centre, persons representing the four seasons at corners of the design, and little heads and praying figures set round about, which appear very Greek in their treatment. Another ceiling decoration—the famous catacomb of St. Calixtus—shows Orpheus with his lute in the centre, surrounded by small scriptural groups, such as the raising of Lazarus, Moses drawing water from the rock, Daniel in the lions' den. This same catacomb of St. Calixtus has excellent examples of the wall-work of the early artists.

In the catacombs we find the first of the innumerable representations of the Madonna and Child which Christian art has given to the world. These pictures are very simple, and, as in the case of the paintings of Christ in his manhood, are not portraits of the ones represented. Mary is shown as an ordinary Roman woman with her baby. In the early paintings Jesus the young man has the appearance of a Greek youth. The traditional bearded face in the pictures of Christ dates from a later time.

CHRISTIANITY SET FREE BRINGS ABOUT A CHANGE IN ART

The art of the catacombs was a mere apprenticeship, leading up to the important work which followed when Christianity became a great power. In the fourth century Constantine issued an edict giving full liberty to the followers of Jesus, and permission to build churches. The Christians had been waiting for this; their faith had assured them of ultimate freedom; their suppressed activities blazed into life. As we look back on these early centuries it almost seems that we can watch the progress of Christian art as of a living thing.

Within a few years of her release from suppression Christianity had evolved a church entirely unlike any other religious building in existence, and lavished a wealth of beauty on its decoration. In two hundred years or so art in Italy developed on these lines. During that time the centre of progress had moved from Rome to Constantinople, and the splendor of Byzantine art expanded to find its highest expression in the Church of St. Sophia, which is one of the miracles of the world.

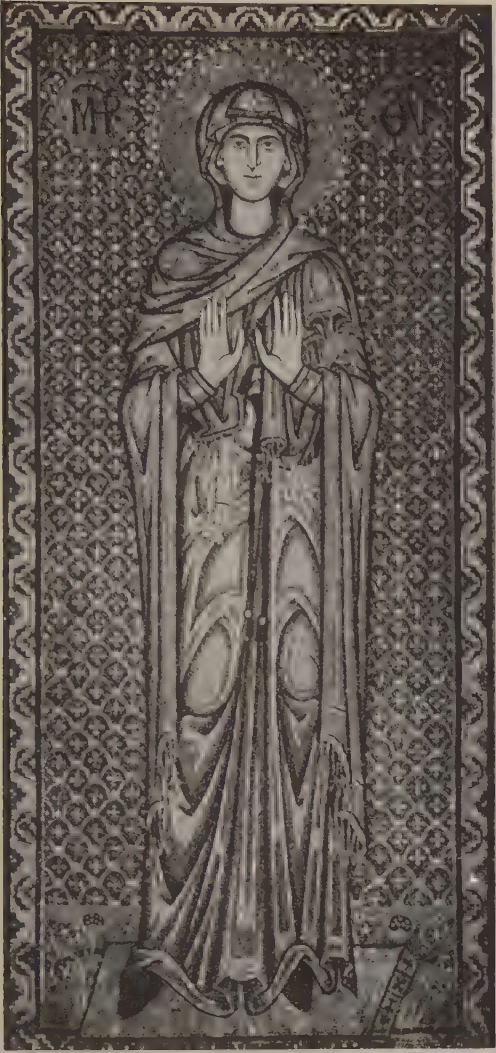
While thus the art of church-decoration became a great force, the quality of Christian art, the motives which had inspired it, had changed. The spiritual feeling of the catacomb-pictures, born in a period of persecution and humility, gave place to the proud glorification of Jesus, Mary and the saints. The artists were no longer praying aloud: they were singing the songs of the Church triumphant.

THE GREAT THING THE FIRST CHRISTIAN ARTISTS DID

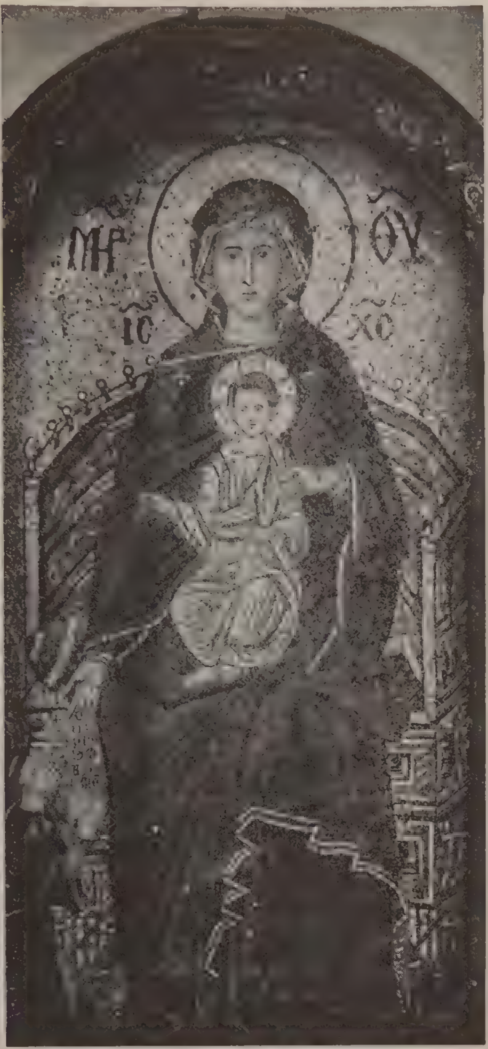
Paintings in fresco and colored friezes were not rich enough as a medium for this glorious sentiment; the artists began to make pictures in mosaic—in small squares of gold and colored glass imbedded in cement. Only in the less important churches did wall-painting continue.

The Romans had learned the art of mosaic work from the Greeks, and had

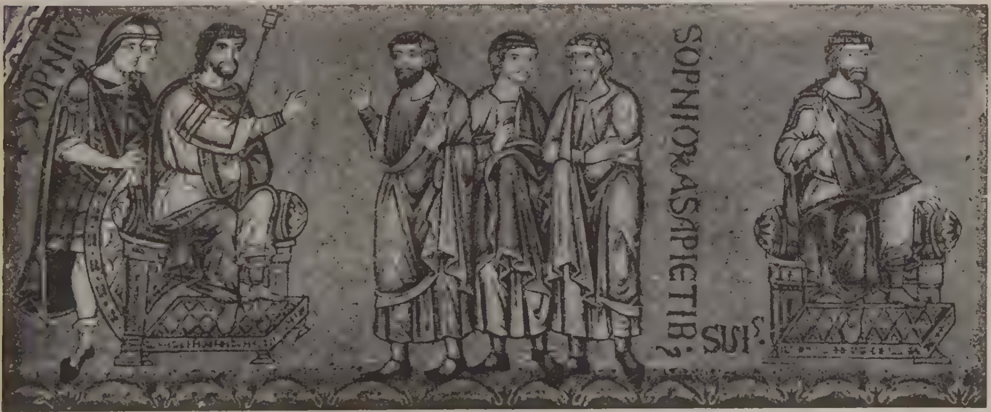
THE ARTISTS IN THE EARLY CHURCHES



A mosaic figure of the Virgin in St. Mark's, Venice.



Mary and Jesus—a mosaic in the Church of St. Gregory, Messina.



A seven-century-old mosaic in St. Mark's, Venice.

used it beautifully in their pavements. The Christians took up mosaic work at this point; that is to say, their first mosaic pictures were executed in colors on a white ground, after the manner of the Italian floor-mosaics. Very soon, however, they had gained a style of their own, and a mastery of technique; in two or three centuries they evolved a distinctive scheme of decoration.

THE SHINING COLOR OF THE BYZANTINE ARTISTS REACHES ITALY

The early churches were peculiarly suited to this wealth of color-display. They were huge buildings erected, with certain adaptations, on the plan of the Roman basilica—a large hall for public gatherings. Their lines were long and straight, the dimensions on the ground counting more than height. On the outside these churches were severely plain, and on the inside, simple in line without breaks in the walls. Rome and Ravenna were the home of the most famous basilican churches. Several were built by Constantine himself.

From the mosaics that still exist we can faintly surmise how beautiful their interiors must originally have been, what a glory of shining color must have mapped the walls! Some of them Time has ravaged; many have been destroyed by fire; those that remain mark a period in the development of Christian art. When the tide of progress had set toward the Byzantine shore, a backwash touched the ground of Italy, and for two or three hundred years an art flourished that was half Italian and half Byzantine. We can trace the curious development from the basilican structures of this time in many Italian towns, such as Milan and Brescia, but chiefly in Ravenna, which during the sixth century became really a Byzantine city.

THE LIGHT FROM THE EAST THAT SPREAD ITSELF IN THE WEST

It would seem that the mosaics in the basilicas showed almost at once that tendency toward the Eastern influence in Christian art which was to become so marked in the Byzantine churches. Just for a short time there was the same artless mixture of paganism and Christianity which we have noted in the catacomb-paintings. There is, for instance, a beautiful narrow frieze in the architecture of the nave in Sta. Maria Maggiore, Rome. The mosaic is blue and red on a gold ground, and it shows a long spiral design based on the acanthus. Little doves flutter through the Classic ornament; every now and then the design breaks and there is a white lamb standing alone—the symbol of Christ. A great many of these mosaics proclaim that Western Christian art was born in a land soaked through with Classic influence. Very soon, however, the work was given up more to religious subjects, and the art native to Italy showed itself only in the border-friezes and curious garlands which the mosaic-makers crowded in abundance about their figures.

The growing Eastern influence in Christian art showed itself in several ways. The Syrian idea of a magnificent deity crept into the work, and we see Christ enthroned on a shining seat beneath a cross sparkling with jewels; Christ between Peter and Paul; Christ between the old law and the new; Christ surrounded by hosts of shining ones. But, generally speaking, the chief characteristic of the mosaics of the Christian churches, Italian and Byzantine, was a kind of narrative art—stories told in color. The walls are unending illustrations of the history of the Church, the life of its Founder, and tales from the Old Testament.

THE MOSAIC-LIKE JEWELS AND THE CHURCH'S CROWN OF GLORY

So real was this instinct to preach, to have the very building itself proclaim the belief of the worshipers, that the art of the churches developed a scheme of ornamentation. The dome was usually set aside for paintings of a visionary nature, and the body of the church for more earthly subjects. From this grew the idea of portraying Christ in the crown of the dome with heavenly legions of angels and archangels ranked around. In the apse the Virgin was generally shown and subjects connected with the sacraments of the Church. The upper walls of the nave were set apart for figures from Old Testament history and scenes from the life of Jesus.

The mosaics were not ordinary pictures. Artists took advantage of the fact that they were working in a very artificial medium to fill in spaces with wedges of color and brilliance. They were not content to place isolated panels or circular decorations in the sacred halls; they literally filled them with mosaic following the lines of the arches, and running up to the roof. The work reached its height in the jewel-like mosaics of the later Byzantine churches which sprang up; its crown of glory was St. Sophia in Constantinople.

This very brilliance presently led to the death of Byzantine art. The life it should have portrayed became pomp and glitter, Oriental pageantry and display. Convention overrode beauty; and mural decoration of the church, which had begun in the mysticism of the catacomb-paintings and grown to the imagery of the basilicas, became under later Byzantine sway a mere mass of gorgeous but cold and lifeless ornament.

In the meantime, although early Christian art was centred in Italy and Byzantium, the religion had spread over Europe, founding a new civilization. North of the Alps, after the reign of Charlemagne, this spiritual force found its expression in a new class of architecture. The timber-roofed structure of the south gave way to vaulted buildings called Romanesque. The churches of this period stand midway between the severe basilican and heavy Byzantine styles and the upward-reaching, airy Gothic which was to transform medieval Europe. A great many beautiful Romanesque churches were built in France; the oldest and most famous lie south of the river Loire. In England the Romanesque tradition, taking root with the Norman Conquest, gave rise to another kind of architecture adapted to the island genius. These new buildings were known as Norman, to distinguish them from the earlier Saxon edifices.

How the first churches were decorated fourteen centuries ago—a mosaic in the church of San Vitale, Ravenna.

The Gothic style followed hard on the heels of the Romanesque. By the twelfth century it was established in England and France; by the thirteenth, in Germany. With it came an instinct for internal decoration on the lines of sculptured figures and reliefs. The reason for this change was that the Romanesque churches had proved unsuitable for wall-paintings or mosaics, owing to their bad system of lighting, and the lines of Gothic buildings did not lend themselves to long friezes.

Of the Romanesque wall-paintings only a few fragments remain. A fine example is in the Church of St. Savin in Poitou, France; another in St. George's Church at Oberzell, on the Reichenau Island on Lake Constance. There is a beautiful painted altar-panel in the Münster Museum; another in the Berlin Museum.

By a pleasant exchange, as the art of wall-painting died out, that of window-staining arose, and enriched the churches with a shadow of the Byzantine brilliance. A school of colored-glass painters grew and reached its highest power in the thirteenth century.

Side by side with this smaller branch of religious art was growing another—the illumination of manuscripts.

From about the first century of our era books were made of sheets of vellum—a fine parchment, originally made from calf-skin—beautifully and marvelously inscribed. There was no limit to the loving and laborious care spent on these manuscripts. Some were written in black ink, with red ink used in headings and titles.

THE LOVELY OLD BOOKS ILLUMINED WITH PURE GOLD

Some were written in gold and silver. The British Museum possesses a copy of the Gospels written entirely in gold.

Vellum was very costly, and in many cases sheets were cleaned of their original matter and used again. Manuscripts written on second-hand vellum are called palimpsests, and are of the greatest value to archæologists, as the ghost of the original characters lies under the new. By restoring the first writing scholars have sometimes found texts of great value.

When paper was introduced for literary purposes, in the thirteenth century, the character of the writing and illumination changed with the rougher surface of the new medium. The invention of the printing-press was naturally the beginning of the decline of both writing and illumination, except for specific purposes. A very beautiful and spiritual art has thus been almost lost to the world.

The real meaning of illuminated manuscripts is a book "lighted up" with gold and clear, radiant colors. The earliest Gospels and prayer-books are in this form. Lovely colors run riot in their pages; the earliest reflect the spirit of Classic art, but for the most part their ideal of ornament was Byzantine, the style of illumination which reached its highest point in the ninth century and for two hundred years was a strong influence. Its decadence, in the thirteenth century, is marked by the same stilted artificiality that stamped the later church-mosaics.

THE FAITHFUL MEN WHO SPENT THEIR LIVES IN MAKING LOVELY BOOKS

The decorations of these illuminated manuscripts took the form of full-page pictures, vignettes and miniatures, marginal designs and very lovely initials. The initials of the finest vellum books are truly a great joy. They fling out their dainty designs to any part of the page; some of them hold a picture within the compass of the letter.

The monasteries were largely the source of illuminated manuscripts, and as monasteries spread over Europe the art of vellum-painting was taken up in England, Ireland, France, Germany and Flanders. Numberless copies of the Gospels, Books of Hours, missals, hymnals and the lives of the saints were produced. They were made for members of the wealthy class and for the inmates of the abbeys and monasteries themselves. There is a wonderful collection of illuminated manuscripts in the Grenville Library of the British Museum. There we can see displayed the strangely lovely design in which little birds and animals and vine tendrils get so delightfully mixed up, and strands of ornament are flung about the text as if they had been living things and the wind had entangled them.

THE MARVELOUS BOOK OF KELLS MADE BY IRISH MONKS 1,000 YEARS AGO

One of the most beautiful things in the world is an illuminated manuscript made by the monks of the Irish monasteries. It is a copy of the Gospels known as the Book of Kells, written and illumined about the eighth century, and now treasured in the library of Trinity College, Dublin. The Irish monks, unlike Byzantine scribes, did not use gold; their ornament is both dainty and rich at the same time. When we see a page of text of the Book of Kells containing an initial or a marginal design we feel that our own illustrated books seem hardly entitled to exist beside these shining glories of long ago.

THE NEXT STORY OF THE FINE ARTS IS ON PAGE 691.

The waves that roll forever, tossed by the moon.

DOES THE MOON PULL THE SEA?

CONTINUED FROM 463

THE moon does pull the sea, and it is the pulling of the sea by the moon that makes the tides. In any great dock or port or harbor we see how the water rises and falls twice a day. We know that the tides, as we call them, with their ebb and flow bring all this water to us and take it away again without ever stopping. The tides never stop because the earth never stops turning, and it is the turning of the earth that somehow makes the tides. Plainly *tides* have something to do with *days,* for they always correspond. Long ages ago, before men knew that the earth turns, they saw, as they could not help seeing, that the tides had something to do with the influence of the moon.

Let us suppose for a moment that the moon did not go around the earth, but simply moved through space with it. Then the moon would appear to rise and set, as it does now, only it would rise and set at regular hours every day. And so, at the same time every day, in any part of the world, there would be tides, as there are now. The only difference between this and what actually happens is that the moon is moving round the earth, while the earth turns on herself. This makes the moon seem to rise and set about half an hour or so later every day. The tides always correspond in their ebb and flow to the rising and setting of the moon.

The moon is made of matter, and so is the water of the sea. All matter pulls and is pulled toward all other matter everywhere. We call this gravitation. The whole earth and the whole moon are affected by this pull; but as part of the earth is ocean, and as water is not rigid, it is specially affected by gravitation. The water opposite the moon at any time is pulled up toward the moon. As the earth is turning all the time this means that a mighty wave of water travels over all the oceans, day and night, in response to the pull of the moon.

If the moon had oceans, there would be tides there, too, owing to the earth's pull; and as the earth is very much bigger than the moon these tides would be enormous. But the moon has no oceans, though possibly it has ocean-beds long since dried up. All the moon does is simply to pull the water toward it as the earth twists and exposes new bodies of water to its powerful attraction.

The sun causes tides on the earth as the moon does, and for exactly the same reason; but the power of gravitation lessens as the distance through which it acts increases. Though the sun is vastly bigger than the moon, it is so far away compared with the moon that its influence on the ocean is comparatively small; but it can be shown.

As the moon goes round the earth once a month, there will always be times when the moon and the sun are on the same side of the earth, and times when they are on opposite sides. When the sun and the moon are pulling on the same side of the earth they help each other; and the tides for a few days will be very high and very low as the water flows and ebbs. At another time in the month, when the moon and the sun are on opposite sides, they pull against each other. The moon wins this tug-of-war, but it has to be content with pulling the water toward itself much less than at the other time, because the sun's pull is now opposing and not helping.

WHAT IS THERE INSIDE THE JUMPING BEAN?

Jumping beans come from Mexico. It is not the bean that jumps, but a little insect inside. A tree which grows in the Mexican swamps near Alamos has curious three-cornered fruit divided into three parts, like little pods. In two of these pods are small black seeds; the third part contains a tiny worm and is what we call the jumping bean. Before the tree can have its fruit it must, of course, bear flowers. An insect visits those flowers, and in part of each deposits an egg. The part which contains the egg grows with the rest of the flower, but, instead of becoming a pod for the seed of the tree, it turns into a home for the insect which is coming from the egg. Later the flowers lose their petals and seed-pods form and ripen. In August the seed is ripe. The husk containing the pods of seed and the little pod with the worm inside drops to the ground and splits into three parts.

The worm has inherited the knowledge that if the bean lies where it falls it will be trodden upon or be eaten by an enemy; so it coils itself up, then lets itself go like a catapult and carries its house with it. It keeps on jumping till the bean is away from the tree on which it grew. In cold weather the insect lies still and sleeps; but as soon as the weather becomes warm it revives and starts jumping afresh. If a hole is made in the bean, the worm fills it up again.

CAN FRESH WATER BE FOUND IN THE SEA?

Large quantities of fresh water are found at certain places in the sea. This is particularly the case at the mouth of large rivers, where enormous volumes of fresh water are continually being poured out into the sea and spread out over the surface for many miles. The outflow of fresh water from the Amazon is over a million cubic feet a second and this is found on the surface two hundred miles from shore. After a while its freshness entirely disappears as its mingling with the salt water is complete. Ships short of fresh water have often obtained a supply from the sea near the mouth of the Amazon.

Off the mouth of this river some years ago a ship saw another vessel flying signals of distress. "Water, water! we are dying of thirst!" ran the message. From the friendly vessel went back the advice: "Cast down your buckets where you are." The distressed ship could not understand and signaled again and again, always with the same result. At last the captain let down his buckets and up they came, brimful of sparkling fresh water from the Amazon's mouth.

But fresh water can be obtained from the sea in a still more remarkable way. Much of the rain that falls in Australia sinks through the soil till it reaches an impervious layer of rock. It runs along the top of this, perhaps hundreds of feet below the surface of the ground, and finally makes its way up through the sea as a submarine spring. Off the eastern coast of Australia fresh water from these springs is often dipped up in buckets by the crews of ships.

Off some of the South Sea Islands the natives dive to the bottom of the sea and fetch up fresh water for drinking purposes in hollowed gourds. This is surely the most astonishing of all ways of obtaining drinking water.

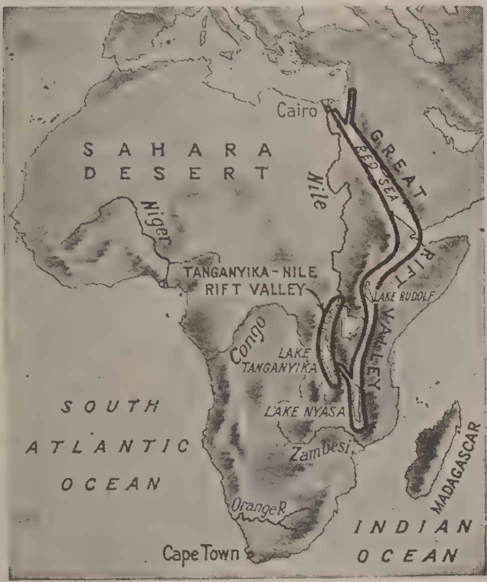
Ground ice has been seen rising to the surface of the sea off the Atlantic coast of America and coming, no doubt, from a submarine spring. When the fresh water reached the cold sea-water, which was below freezing-point, it rapidly froze into ice and, being lighter, rose to the surface.

WHAT IS KNOWN AS THE GREAT RIFT VALLEY?

The Great Rift Valley is a gigantic crack in the earth which begins in Palestine, in the valley of the Jordan, and runs down to the south of Lake Nyasa in East Africa, something like twenty-five hundred miles. The Dead

Sea lies in one of its deepest parts. It widens out to form the Red Sea, which is bounded by the high plateau of Arabia on one side and of Egypt and Nubia on the other. At the south end of the Red Sea the Great Rift sweeps inland and includes a chain of lakes from Lake Rudolf down to Lake Nyasa.

From the northern shore of Lake Nyasa another rift valley, generally regarded as a second branch of the Great Rift Valley, sweeps westward, and then north, embracing in its course the great lakes of Tanganyika, Albert Edward Nyanza and Albert Nyanza.



The Great Rift Valley in Africa.

The Great Rift Valley is the biggest crack in the world, and is formed by two parallel fractures in the earth's crust running side by side, with a sunken part of the crust between them to form a deep valley. The Rift is of comparatively recent formation in the earth's geological history, for the steep sides of the valley are as yet little worn down by the erosion of wind or water. There has not yet been time for the wearing-down.

Such rifts are rare, though several of them are found in different parts of the world. The Rhine Valley is one, and a similar rift, on a smaller scale, is to be traced in the Lowlands of Scotland. The fractures causing the Rift Valley formation are due either to strong lateral (sideways) pressure of the layers of the earth's crust or to a stretching of the layers.

DOES THE SMOKE OF A TRAIN GO THE OPPOSITE WAY TO THE TRAIN?

When the smoke leaves the funnel of the engine it is really moving forward, like the engine itself, and at the same rate. If we could imagine that the train was moving onward in *nothing*, then, as we know that moving things always move on in a straight line at the same speed forever, unless something outside stops them, the smoke would move forward with the train and would actually pass on in front of it as soon as the driver slowed the train. But the smoke is really poured into the ocean of air through which the train is pushing its way. The air tends to stop the train, as it tends to stop everything that moves through it Every engineer knows how important this air-pressure is. But though it retards the heavy train a good deal, it retards the light smoke far more. The smoke does not really go the opposite way to the train; it is actually going in the same direction, but so much more slowly that it seems to go the other way, as a slow train seems to be going backward when seen from a fast train passing it.

WHY DOES A MOTH FLY ROUND AND ROUND A CANDLE?

No one can say what it is in the brain of the moth that inspires it to like the light; and it is quite clear that this liking does the moth no good—at any rate in the case of a candle. It may possibly be that it benefits the moth to fly toward light from darkness; and perhaps we should find this to be so if we knew enough of the lives of these creatures. Different plants, and different parts of the same plant, behave in similar ways; and if we notice the behavior of a baby toward a bright light we shall see that it is really like the moth. We find also that different creatures tend to move toward or away from other things besides light, such as heat, gravitation, electricity, and all sorts of chemicals and smells. Some grown-up people are like the moth—they move to the sunny side of the street; and others are like insects that usually live in darkness and fly toward it—they move to the shady side of the street.

WHY DID ROMAN MATRONS MOURN FOR CORIOLANUS?

Coriolanus was a Roman warrior of great military talent, though the Romans banished him. In his great wrath he raised the hosts of the Volsci against Rome. Great was the anxiety among the Romans. Embassies carried to Coriolanus the pleadings of his countrymen; heralds were sent to solicit his return; but all in vain. At last it was suggested that the exile's mother Veturia and his wife Volumnia should go and implore him. Love prevailed. Coriolanus yielded to their tears and sent the Volsci back. Coriolanus became a victim of the resentment of Rome's enemies, for historians report that he died soon after, stabbed by a Volscian. The Roman matrons wore mourning in memory of Coriolanus, and a temple was built in honor of the women whose love had conquered and brought the warrior home.

DOES SOUND TRAVEL IN STRAIGHT LINES?

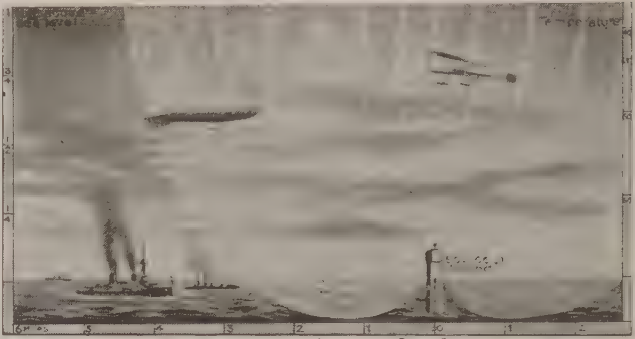
For sound to exist at all there must be a medium in which the air-waves caused by a vibrating body can travel. If the vibrating body were in a vacuum, nothing would be heard, but if the vibrating body were in perfectly still air, the sound-waves would spread outward, as a soap-bubble spreads. In the first picture on this page sound-waves are traveling at the rate of 1,118 feet a second.

There are many things, however, which affect the speed and direction of sound. Wind, fog and temperature all play their part.

The bubble of sound-waves is distorted by wind, as seen in the second picture on this page. As the direction of a sound-wave is determined by its shape, the sound will probably travel in an entirely different direction from that in which it set out. Sound travels quicker in warm air than in cold air.

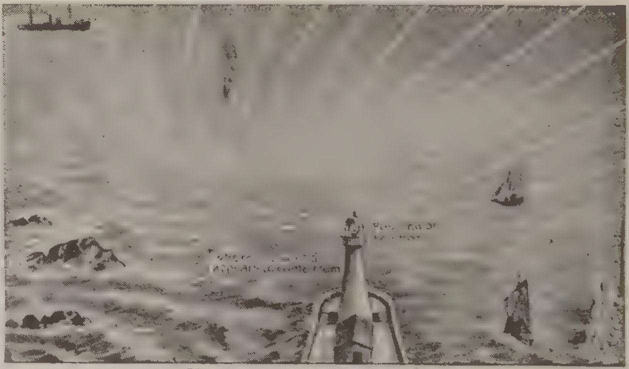
It has been noticed in fogs, particularly at sea, that sounds heard at great distances have not been heard closer to their source; and also that sounds appearing to come from a certain direction have actually come from an entirely different quarter. Fog, in fact, has more effect on sound than any other cause. This is because in a fog there are such great variations of heat and cold, the outside layer very often being quite hot and the interior quite cold.

Sound travels four and a half times quicker in water than in air. It travels faster in steel than in any other substance, or sixteen times quicker than in air.



How sound travels on a fine day.

How sound travels on a windy day.



How sound travels in a fog.

WHAT IS MEANT BY THE TERM PHOSPHORESCENT LIGHT?

Phosphorescent light is not, as one might suppose from the name, the light given off by phosphorus in the dark. Indeed the light given off by phosphorus is not, strictly speaking, phosphorescent. By phosphorescent light scientific men mean light given off by certain substances after they have been exposed to sunlight or subjected to the action of X-rays or radium. Only a few substances give off light in such circumstances. Luminous paint is phosphorescent; it is usually made of zinc sulphid mixed with a trace of radium. The flying particles of radium by hitting the zinc sulphid cause it to phosphoresce, or become luminous, by giving out phosphorescent light.

DOES A PLUMB-LINE ALWAYS HANG STRAIGHT?

A vertical line at any point can generally be determined by suspending a plumb-line, or a weight attached to the end of a string, and allowing it to come to rest. The pull of the earth, or gravity, as we call it, will stop the swinging of the plumb-line. If we could see the line of the pull of the earth we should see that it passes through the motionless bob, the string and the support from which the string hangs. As the string is in the same line as the earth's pull, we say it hangs vertically.

At some places, however, it is found that the plumb-line does not hang quite vertically, and where this is so we know at once that some other attraction must be acting on the weight. Sometimes this is a mountain. Dr. Maskelyne, a former Astronomer Royal, found that when he suspended two plumb-lines near the mountain of Schiehallion, in Perthshire, one on the north and the other on the south, the angle between their directions was greater than the angle between two vertical plumb-lines should be. On measuring he found that each plumb-line was pulled slightly toward the mountain. The mountain was attracting the weights and drawing them slightly toward itself.

We can understand this; but in India a very strange thing happens. When a plumb-line is suspended in the southern or peninsular regions, it hangs quite vertically; but when taken north, it is pulled, not toward the Himalaya Mountains, drawn in that direction by their mighty mass, but away from the mountains, toward the southern plain.

This behavior of the plumb-line, so different from what we should expect, is due to the fact that the weight of the great table-land of Southern India, and the material lying beneath it, is greater than the weight of the Himalaya Mountains and the material below them. The heavy plain attracts the bob of the plumb-line away from the lighter mountains, massive though they appear to the eye. The unseen attraction is greater than the visible attraction.

WHY IS THE WALLACE LINE OF IMPORTANCE?

The surface of the world was not always as it is now. In former times land now under water was dry land, and mountain ranges now towering to the clouds were deep under the sea.

Not so very long ago, as geological time goes, it would have been possible to walk on dry land all the way from Scotland to Iceland. At one time, too, there was a continent in the Atlantic, and coral reefs where the Dolomites and Alps now stand.

Naturally, the distribution of land plants and animals has depended very much on the distribution of land and sea. Differences in the plant and animal life of various countries have been explained by long absence of land connection, for land animals cannot usually swim far, and seeds are not often carried across wide expanses of water.

The animals of Australia, for instance, and of New Guinea and all the eastern Malayan and Pacific islands are quite unlike those in adjacent islands and in the rest of the world. There are almost no mammals, and there is abundance of marsupials. This difference, as Alfred Russel Wallace first pointed out, is due to a channel of deep-sea water which cuts off Australia and the islands mentioned from the rest of the world. This deep channel is called the Wallace Line. We see it marked on the map of Australasia.

WHY IS SEAWEED USED AS A FERTILIZER?

Seaweed is a sea plant and resembles in its chemical composition the chemical composition of land plants. When it decays and decomposes it breaks up into substances which serve as food for land plants. It is specially rich in potassium salts. At one time a great deal of seaweed was burned in order to obtain those salts from it. Salts of potassium are very valuable food for some plants, such as potatoes.

THE NEXT WONDER QUESTIONS ARE ON PAGE 685.

A GREAT BOTANIST AND A GREAT ANATOMIST

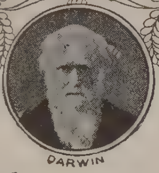
Linnæus, the great Swedish scientist, was the father of modern botany, for it was he who first arranged the world's plants in a scientific manner. Here we see him as a young man, just returned from a long botanical ramble. He and his dog are exhausted, and on the table we can see the results of the walk.

Baron Cuvier, one of the greatest scientists of modern times, was the first to show the close relation of living animals to extinct monsters. From a handful of fragments of bones he could make a restoration of a whole animal's anatomy. "Linnæus and Cuvier have been to me as gods," said Charles Darwin.

SOME EUROPEAN MEN OF SCIENCE

DARWIN SPENCER OWEN CUVIER BUCKLAND LINNÆUS
HUXLEY TYNDALL LYELL LIEBIG HUMBOLDT LEIBNITZ

CONTINUED FROM 471



SOME of the greatest men of all ages have been those who have extended our knowledge of science without inventing anything which can be touched or handled. Yet the value and importance of their discoveries have been more than we can reckon. We shall here glance at the careers of a few such men, remembering that they are representatives, and not the only men who could have been chosen.

First we shall take Gottfried Wilhelm Leibnitz, a German philosopher, who was born at Leipzig, in July, 1646. As a boy he set himself to study subjects which the ordinary scholar would think too dry. His father died in 1652, and little Gottfried was allowed by his mother to read at will in the family library. The result was that when, at the age of fifteen, he went to the university, he was soon able to publish two valuable treatises on the philosophy of law. He studied chemistry, philosophy, law, politics and religion; and before long he knew all the great men in Germany.

At this time Louis XIV of France was thinking of invading some of the German states; but Leibnitz wrote a work suggesting the invasion of Egypt by France. It was not very friendly to Egypt, but it saved Germany; for the king became interested in the scheme, and refrained from attacking that country. We shall hear of the plan of Leibnitz later in our story. Leibnitz traveled to London, where he met the great scientists, who had just formed the famous Royal Society. Newton was one of this company, and the friends of Leibnitz and the friends of Newton were destined to quarrel over a great mathematical discovery which both men had made independently. Leibnitz framed a great scheme of philosophy; he gave us laws enabling us to understand the meaning and force of energy; he collected a great deal of material showing the history and relation of the various languages of the world; he helped to establish scientific institutions, like the Royal Society, in various European capitals; and he labored to better the health of mankind.

Leibnitz died at Hanover in 1716; but nine years earlier a little boy had come into the world, of whom men were to hear much. This was Carl, or Charles, Linnæus, who was born the son of a poor clergyman, at Rashult, Sweden, in May, 1707. The father had a garden, which he stocked with common and uncommon plants, and here little Carl loved to study nature. Flowers which had no meaning for others seemed to be an open book of knowledge for him, and many were the experiments he would try, by bringing in new wild flowers from the woods and planting them in his father's borders.

CHARLES LINNÆUS, THE POOR BOY WHO BECAME FAMOUS ALL OVER THE WORLD

In 1727 he was sent to Lund, and afterward to Upsala University to study medicine, but he devoted himself mostly to the study of botany.

His love of nature was discovered by a kind professor, through whose help Linnæus was sent on a scientific tour in Lapland. The book which he wrote, giving the result of his travels and investigations, brought him the friendship of a rich Dutch banker, who employed Linnæus to superintend his lovely garden. The naturalist delighted in this work. He classified all the plants and trees and shrubs, and, while so studying, wrote his first great work on the scheme of things in nature as it seemed to him.

Afterward he held various professorships; he lectured and practiced as a doctor; he was honored by his sovereign, and was able to buy himself a charming little estate, where he gathered together a wonderful collection of plant and animal life. This collection was afterward bought for England. His days closed in peace and happiness in 1778; and he was beloved and greatly respected by the whole of Europe.

THE BOOK BY LINNÆUS THAT HELPED ANOTHER BOY TO WIN FAME

Linnæus was the founder of modern botany. He classified all plants and trees in scientific order. He did the same thing for the animal world. He thus laid the foundation of classification for the whole realm of nature. His work has, of course, been greatly extended and developed; but it is his system which we have followed, and his scientific names which we employ; names which describe in Latin or Greek the nature and characteristics of the animal or plant to which a title has to be given. He it was who brought order out of chaos in nature's great family. One of the first fruits of the labor of Linnæus was to win for natural history the services of the great Leopold Christian Frédéric Dagobert Cuvier, whose literary title was "Georges Cuvier." He was born at Montbéliard, at that time belonging to Württemberg, in August, 1769, of French parents. Cuvier proved a diligent student, and assembled all the cleverest boys in his school and formed what they called an academy of learning.

So deserving a boy was Cuvier that the Duke of Württemberg sent him to the Stuttgart University, where, to his intense joy, he was given a copy of one of the master works of Linnæus. From that time he devoted himself to the study of natural history. He had to serve for a short time, on growing up, in a Swiss regiment, but when he was eighteen years of age he entered the service of a family in Normandy as private tutor. Here he remained for six years, sheltered from the horrors of the Reign of Terror; and here great events followed a very simple thing.

HOW CUVIER LEARNED TO READ THE WONDERFUL BOOK OF THE EARTH

Some fossils were dug up near his home, and diligent study of these revealed to Cuvier wonders of the past of which no one else had dreamed.

Up to that time fossils, which had clearly at one time been animals, were regarded as freaks of nature. It never occurred to men that these fossils had any relation to living things, or that their descendants were alive on the earth before their eyes. But Cuvier had got a clue, and he now entered upon a work from which he never turned back. He filled important public offices in France, and did much for the nation when given control of her educational system; but he is of most importance to us as the father of palæontology.

The word palæontology is made up of three Greek words—*palaios,* meaning ancient; *onta,* meaning beings; *logos,* meaning discourse. Hence the word means the science which treats of living things that inhabited the earth in ancient days. All the wonders of the past—of which we read on page 91 and succeeding pages—are revealed to us by the palæontologists, of whom Cuvier was the first. He was also a great comparative anatomist. By comparing the anatomy of various animals he was able to discover those features in which they resembled each other and those in which they differed, and so to classify such animals scientifically.

Here is a little story showing how well his classification helped him to a decision respecting the characteristics of animals.

One of his students determined to give him a fright; so, dressing himself up as an animal, he crept one night into the professor's bedroom.

"Cuvier," he cried, in a hollow voice —"Cuvier, I've come to eat you!"

The naturalist peered at him and laughed.

"What, horns and hoofs—graminivorous—you can't!" he said.

He saw that the supposed monster had horns and hoofs, and he knew that all such animals eat grain or herbage, not flesh.

Cuvier was one of the greatest naturalists that ever lived, but, for all his knowledge and for all his intellect, he followed Linnæus in making a serious error. Both believed that a species cannot change. Let us leave this problem for a moment; we shall return to it later, when we meet Charles Darwin.

HUMBOLDT, THE GERMAN BOY WHO LISTENED TO TALES OF CAPTAIN COOK

Another great naturalist was born in the same year as Cuvier. This was Friedrich Heinrich Alexander von Humboldt, who was born in Berlin in 1769. While Cuvier dug down into the earth for secrets of the past, Humboldt went exploring to explain the mysteries of present-day life. He was studying at a university which then existed at Frankfort-on-the-Oder, when he met George Forster, who had accompanied Captain Cook on his voyages. Hearing Forster's tales, Humboldt was fired with a desire to travel.

But he had to wait until he was thirty before he could start. The great French wars of the period made it impossible for anyone to send out ships merely for exploration and study. In 1789 Napoleon, acting on the plan submitted by Leibnitz to Louis XIV, did decide on invading Egypt; and Humboldt should have gone, but at the last moment there was no room for him in the ship.

In the end it was under the flag of Spain that he sailed. Spain owned nearly the whole of South America, except Brazil, at the time that he went forth to explore. He made a wonderful journey, lasting nearly five years. He explored Venezuela, Colombia, Ecuador, Peru, Cuba and Mexico. He learned the manners and customs of their peoples, saw the relics of the marvelous old civilization dating back to times before the arrival of Columbus in America. He learned all about their wonderful birds and animals and fishes.

THE WONDERS OF LIFE IN AMERICA OF WHICH HUMBOLDT TOLD THE WORLD

Among other things, he saw the electric eels in their native rivers, and collected specimens of birds, fishes and animals previously unknown to Europe. He made scientific observations which led to the establishment of magnetic surveys by all the nations. He braved many perils in exploring the mighty waters of the rivers Orinoco and Amazon and their tributary rivers; and during his travels his right arm was poisoned, partly crippling it for the rest of his life.

When he returned to Europe, taking with him his collection, he had years of work before him in order to give to the world the result of his investigations, in geography, in the manners and customs of the peoples, and, above all, in natural history. His books ran to thirty great volumes, with hundreds upon hundreds of illustrations. When he was sixty years of age Humboldt undertook another exploration, this time in northern and central Asia. Here, again, his travels, though rapid, were of importance in giving us knowledge of the subjects in which he was interested.

THE BUSY GREAT MAN FOR WHOM A SERVANT WOULD NOT TELL A LIE

The greater part of the last thirty years of his life was spent in Berlin, where he died in 1859; but he loved Paris, and would steal away to work there in peace and quiet. He was always accompanied by a faithful, honest old Swiss servant, who would not tell a lie. So, when the people used to call at the little house in Paris where Humboldt was secretly working, the servant would say, in answer to inquiries: "Yes, my master *is* in, but he wants me to say that he isn't."

That great geologist, Sir Charles Lyell, went, like Cuvier, to the rocks for his facts, but his purpose was to tell the story of the earth itself. He was born in Forfarshire, Scotland, in 1797, and at Oxford University became a good classical scholar. His parents wished him to follow the law; but, though he did become a barrister, his heart was not in lawyers' laws, but in nature's laws. At Oxford he had heard the lectures in geology of William Buckland, the famous scientist who, in his later years, became dean of Westminster.

HOW LYELL BUILT UP THE STORY OF THE EARTH OUT OF THE ROCKS

Buckland afterward took Lyell for a trip to Scotland to study geology, and after that the young man's heart was wholly given to science. Through Buckland he met Cuvier and Humboldt, and their friendship and counsel further inspired him. He gave up the law and turned entirely to the study of geology. He traveled all over England and Scotland, and in Europe and America. The outcome of his work was a great book on geology, which for the first time made clear the story of the earth as we know it to-day.

Previous opinion had been that the form of the earth's surface, her great mountains, her deep valleys, her vast ocean-beds, had been caused by terrible disasters; that the world had been wrenched and twisted and distorted by earthquakes and volcanic eruptions. But Lyell showed that the causes which had made our world what it is are still in operation before our eyes to-day. He showed that, though a volcano may be created in a night, mountains *grow;* that the shrinkage of the earth, and the terrific pressure which it causes, make mountains rise out of flat rocks; that great folds in the solid rock are caused in the same manner; that frost and rain and wind wear down mountains, and cast their débris into the sea, to build up there, at the bottom of the water, land which will some day rise above the sea to form new continents when the existing ones disappear.

LIEBIG, THE SHOPKEEPER'S SON WHO BECAME THE WORLD'S GREATEST CHEMIST

Buckland helped to make Lyell a geologist. He was also the means of bringing to the aid of British agriculture one of the greatest chemists of all time, in the person of Baron Liebig. Liebig was not born a baron, but was the son of a poor dry-salter of Darmstadt, Germany, in which town Liebig was born in May, 1803. He loved to try the experiments of which he read in old books. After many struggles for education he was befriended by the good-hearted Humboldt. Through his influence and the help of other friends, Liebig went on with his studies and in time became the greatest chemist and the greatest teacher of chemistry in Europe. He gave new life to chemistry, and trained men from all parts of the world. The thing that he did for England was in relation to agriculture.

In spite of the ordinary farmyard manure, the land was getting poorer and poorer, because the crops took so much out of the soil that could not be replaced. Liebig insisted on the use of artificial fertilizers, chemical substances containing the properties which the land requires.

Now, one day Buckland had noticed ladies wearing, as part of their jewelry, stones which, by their markings, he recognized as fossils. These ornaments were neither more nor less than food which, eaten millions of years ago by animals, had been converted in the earth into fossils. He discovered great stores of these coprolites, as he called them, buried deep in the earth.

THE BEGINNING OF A GREAT INDUSTRY, AND THE BIRTH OF A GREAT MAN

Liebig went to visit Lord Playfair, a great scientist and noble-hearted man, who, among other things, had translated Liebig's writings into English.

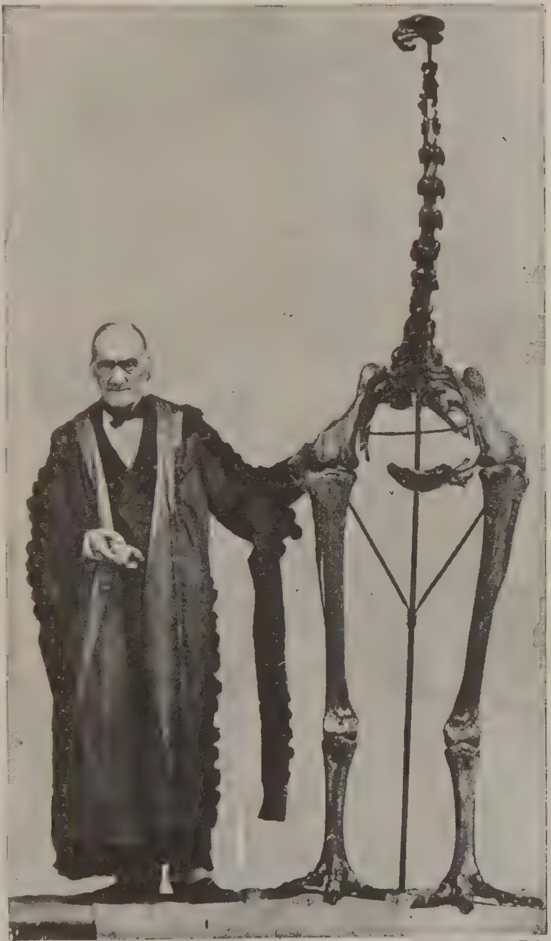
When Liebig was visiting Playfair, Buckland showed him his store of fossils. Playfair took away some of the fossils, had them ground up in his laboratory, and found that they abounded in phosphate of lime, the very thing the soil needed. This at once gave Liebig the idea of utilizing ground bones for fertilizing the soil, and then and there began the great artificial-fertilizer industry in England upon which its agriculture so much depends.

While Liebig was at work enriching the soil, there was another great man, Sir Richard Owen, delving in it for more of its secrets. Owen was born at Lancaster, England, in 1804, and lived to be eighty-eight. From early manhood to the last years of his life he was pouring out a flood of knowledge for us upon life in the ancient world; upon the work of the human body as it is to-day, upon geological problems, and upon a thousand matters relating to natural history.

And yet this great scientist had no other ambition in early life than to go to sea, perhaps as a ship's doctor! While waiting for an opening in the navy he entered the service of the Royal College of Surgeons, and was placed in charge of the magnificent natural-history collection got together by John Hunter, for whose life story look in the index. Owen devoted years and years to classifying and explaining this collection in printed books. He met Cuvier, and carried on in England the work which the Frenchman had begun abroad. Owen rivaled Cuvier in piecing together the life-history of an animal or a bird of which he had but a single bone. The most famous achievement was with the extinct Dinornis, the giant bird of New Zealand. Someone sent over a leg-bone of one of these birds, a fossil bone thirty-four inches in length. From that single bone Owen was able to picture and describe the whole bird.

Later more bones of such a bird were discovered in a river-bed in New Zealand, and, when put together, they were found precisely to correspond with the description which Owen had given.

Owen did much for the spread of scientific teaching. King Edward VII and the Duke of Connaught passed many happy hours listening to his lectures at Buckingham Palace. One day the Duke of Connaught, who was then quite a little boy, was so delighted that at the end of the lecture he secretly followed Sir Richard out into the corridor and, as a reward for the pleasure he had had, played him a tune on a new musical-box which had just been given to him. No wonder that the great scientist thought the royal children were delightful little people. We have seen that Owen was a disciple of Cuvier and of Linnæus, and that these two did not believe that species could vary. Therefore we may know that Owen did not see things in the same way as Charles Darwin, the man who caused a greater sensation than the world of thought had known since Newton discovered the law of gravitation. Men had thought, as we have seen, that species could not alter. They thought that for every species there had been a separate creation. They thought that the remotest ancestors of cats had always been cats; that dogs had always been dogs, that wolves and jackals and hyenas, lions, tigers and leopards had, in the past, always been exactly as they are to-day. They thought that all living things had descended from ancestors exactly like themselves, that there had been no change in animals or plants from the dawn of creation. Darwin is dead and gone, but his work will live forever, and we may easily see the plan of his teaching from three simple things that he left among the specimens which he collected during his lifelong studies.



SIR RICHARD OWEN AND THE SKELETON OF A BIRD

Professor Owen built up this skeleton of a Dinornis, an extinct bird, that no living man had seen, from a single bone sent him.

First, we notice a common Indian jungle fowl. That bird is descended from fowls like itself, but from that family of fowls have come all the varieties of domestic fowls. Next, we have a common blue rock pigeon, which represents the parent stock from which are descended all our pigeons—homers, pouters, fan-tails, turbits, Jacobins and the rest. The third is a common wild Chinese chrysanthemum. Wild chrysanthemums like this are the parents of all the chrysanthemums in the world. And what has happened in regard to poultry, pigeons and chrysanthemums is believed to have happened also in the case of thousands of other species in animal life and plant life. Some specimens differ so much that it is hard to believe they are related.

The man who taught this strange doctrine, and gave such a mass of knowledge to the world—Charles Robert Darwin—was born at Shrewsbury, England, in February, 1809. He was the son of a doctor, who intended him first, for the profession of medicine, then, for the Church. But he soon proved that he was a born naturalist, and when there came the chance of going for a five years' scientific cruise round the world in the ship Beagle, he earnestly begged his father's permission to go.

WHAT THE WORLD OWES TO THE SHAPE OF A BOY'S NOSE

His father thought that it would ruin his character to go; it was a mad scheme, he declared. Still, he said, if the young man could find one reasonable man to support him in his desire, then he would give his consent. Darwin found that one man, his uncle, a man in whose judgment the elder Darwin had great faith. The uncle was of opinion that the youth should go, for he had been impressed by the fact that the young man had a nose of peculiar shape. Darwin used afterward to say that his whole career depended upon the shape of his nose; and we may add that the world owes to that little peculiarity the vast sum of knowledge which Darwin by this voyage was able to contribute. Upon such trifles do great events turn sometimes.

The tour round the world gave the careful and observant Darwin a rare opportunity for observation of all kinds of animal life under all sorts of conditions. We must all read for ourselves his delightful volume on the great voyage. Not very long after he came home, he married happily and settled down in a pretty old house at Down, in Kent. There, year after year, he toiled away, arranging and describing the specimens which he had brought home; there he watched his poultry and pigeons and dogs, his fruit and bees and flowers, and all the time his great mind was slowly working its way toward the light with regard to the wonderful theory which we have been considering.

HOW CHARLES DARWIN & ALFRED RUSSEL WALLACE THOUGHT THE SAME THING

He was a slow worker, for his health was bad, and he was nervous about making a statement which might be challenged. Little by little he was building up his theory, and at various times he had shown some of his written conclusions to Lyell and others. What would have happened otherwise we do not know, but before his greatest book was published a very romantic thing occurred.

Dr. Alfred Russel Wallace, who was at the time exploring and studying in the Malay Archipelago, sent him a paper which he had written, showing that, all unknown to each other, the two men had been working in the same direction. They had both arrived, by separate paths, at the same conclusion. The most startling theory in the modern history of knowledge had come to two men at about the same time. Friends of Darwin to whom he showed Dr. Wallace's paper told him that he ought to present side by side with it his own studies which had been so long in preparation. The two papers were read at the same meeting of the Linnæan Society. Dr. Wallace, who kept on traveling and studying until his death in 1913, did not believe exactly the same as Darwin; but the two men were firm friends. In 1859 Darwin published his masterly work, The Origin of Species. It created a furious storm of criticism, which raged through England, the Continent and America, but Darwin's views gained many supporters.

THE QUIET OLD GENTLEMAN WHOSE TEACHING STIRRED THE WORLD

He went on working in the same line, and produced almost as remarkable a book on the descent of man. Other great books dealt with the changes which come over plants and animals under domestication. Another gave us the wonderful history of the soil of the world, and another dealt with the life of the worm. Darwin's was a full life and a beautiful one. Everybody loved him; he was so simple and kind and generous and tender. Nobody could have believed that this shy and modest old gentleman could be the great Darwin who had stirred the minds of the whole world, and whom scientists regarded as greater than any king. When he died, in 1882, the nation mourned and buried him with honors in Westminster Abbey.

Another great teacher of the nineteenth century was Herbert Spencer. His life began at Derby, England, eleven years after Darwin was born, and ended twenty-one years after Darwin's death. The two men were each the counterpart of the other. Indeed, Spencer was an evolutionist before Darwin was. Darwin was the great biological specialist; Spencer was the profound philosopher. His father was a teacher, and, because of ill-health, the boy studied at home. Very early he showed a fondness for nature, spending much time out of doors. He enjoyed studying botany and made a collection of insects. He watched moths and butterflies develop, just as many a boy had done. Yet he had ability in mathematics and mechanics.

HERBERT SPENCER, WHO SPENT FORTY YEARS WRITING A BOOK

While still very young, Spencer found work in a railway engineer's office, and the next ten years were devoted to engineering. Then, as there was a difficult period for the railways and no other work of that sort opened for him, he went to London and turned to journalism for a while. Always he went on studying with eagerness, until a breaking-down of his nervous force made it necessary for him to limit his hours of mental effort.

His writings were always on the serious things of life, on government and social subjects. He was poor—very poor—and suffered all his long life from ill-health—sleeplessness, and all the unspeakable miseries which that misfortune carries. But, in spite of poverty and illness, he set himself to write a whole scheme of philosophy in ten great volumes. He gave himself twenty years in which to do the work. He was then nearly forty, and the work took him forty years to finish. His plan was to gather into one system the general principles of all the knowledge in existence. Few men could have undertaken such a task; but Spencer had a very wide acquaintance with the facts of the different sciences, his power to get a general view of these facts was unusual, and he had a rare faculty for seeing relations and connections between the various phases of nature. The books were not such as people would readily buy. They were dry, and hard to read, wonderful as they were in the way of learning and reasoning. Three times in those forty years he felt that he would have to close the publication on account of his poverty, but thrice in the nick of time came legacies enabling him to carry it on, and at last the work was finished. By this time his fame was world-wide. His books were widely read in England and America, and with still greater interest on the continent of Europe.

His influence was especially strong in Russia, where the peasants had been making great efforts to obtain liberty and enlightenment. His books were translated into Russian, and it is said men would ride forty or fifty miles from village to village with a copy. All the villagers would gather together while someone read the book to them; then a rider would carry the volume on to the next village, so that Herbert Spencer became as well known among the peasants of Russia as he was in learned circles throughout the world.

JOHN TYNDALL, THE ENGINEER WHO BECAME A GREAT TEACHER OF SCIENCE

Two other great names stand out, and we must glance briefly at them. First, we have John Tyndall, physicist and philosopher and great teacher. The son of a policeman, he was born in Ireland in August, 1820, and died in Surrey in 1893. Losing no opportunity for study, as a young man, he made point after point of advance. At one time, like Spencer, he earned money by working at railway engineering; then he became a teacher in a Hampshire college. With the money he saved he went to a German university for further study, to obtain a doctor's degree. His scientific researches led him to several important discoveries in different fields. Among other things, he proved certain truths about the action of vapors and gases, about the way in which heat radiates, about the formation of glaciers and their movements. In mountain-climbing he combined scientific study with recreation; for the time he spent in the Alps brought him twofold results—the vigor gained by exercise and a knowledge of the Swiss glaciers.

Tyndall would have been a notable man for his work in the laboratory, but it was his eloquence upon the platform and his power of saying difficult things in easy language which made him famous. He became a great teacher—one who helped the unscientific to understand science. And he took a prominent place in the world of thought as one who seconded the beliefs of Darwin and Spencer. Without Tyndall these two thinkers must have lacked one of their sturdiest supports, and the British nation one of its best and clearest teachers.

When, in 1872, Tyndall came to the United States and gave a course of lectures, he refused to keep the money he received, and placed it in the keeping of trustees to be used for the advancement of science in America.

Alexander von Humboldt in the Kosmos, the crowning work of his life, written after he was seventy-five, shows unity among the complex phases of nature.

Thomas Henry Huxley, with whom we close, was a kindred spirit of Tyndall, but his early days had been more like Darwin's, except in the matter of means. Huxley's parents were not in good circumstances, and the boy, who was born at Ealing, England, in 1825, had a hard struggle for a medical education. He wanted to be a mechanical engineer, but had to be a doctor. So a doctor he became; but, like Darwin, he found fame on the sea. He had on the Rattlesnake an appointment similar to Darwin's on the Beagle; and, after voyages in two ships, came home with a fine collection of specimens from which he hoped to give the world new light on various points in biology. But he had no money with which to carry out his work; and, in order to get means with which to live, he was on the point of throwing aside his collection and going off again to sea, when, luckily, he was appointed lecturer in the Royal School of Mines. At last he was able to carry on his work and make his influence in science felt.

He had wretched health, but he had the courage of a lion, and worked when other men would have given up the fight. By diligent study he made himself one of the most lucid and attractive writers and speakers in England. He had wit; he had lightning readiness, which he claimed came to him from his mother; and he had eloquence. Best of all, his soul was in his work, and he spoke not only from the abundance of his splendid brain, but from his heart. His value as speaker and writer was never more apparent than when Darwin published his Origin of Species. Critics fell upon it to rend it to pieces, but Huxley was superb, and turned the battle against the enemies of the man who was too shy to appear in public debate to face his fierce critics. Huxley soon became the most famous popular lecturer on science of his day. His lectures attracted crowds, among them workingmen and the richest people in London. No man had more influence. One day he hailed a cab and bade the driver take him to a hall where he was about to lecture. Arrived at his destination, Huxley offered his fare, but the cabman would not take the money. "No, Mr. Huxley," he said; "your lectures have done me too much good for me to let you pay me my fare. It is an honor to have driven you, sir!" And Huxley accepted the compliment and passed to his lecture a happy man.

In 1876 he was in America to make the opening address at Johns Hopkins University and give several lectures in New York. Huxley lived for seventy years—one of the brightest figures of the nineteenth century, a man of spotless life and of unselfish devotion to the service of his fellows and to the science that he loved and adorned.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 701.

Out in the storm.

THE WILD DOGS

CONTINUED FROM 502

WHEREVER men venture into the wilds, sounds of animal protest are heard. They are the voices of the dog tribe stirring in the night-time. Wolf, jackal, fox or wild dog, they are found over the greater part of the earth. Where we go, there they are, before us or perhaps in pursuit of us. Where we can barely maintain life, they find food. Where we starve and die, they can flourish. Let us look at them in their haunts.

Sledging through the Russian night, Miss Marsden, an English missionary, said to her driver: "The cold and darkness make me afraid. Let us shelter in one of those cottages whose lights I see." "Madame," said the Russian, "those are not cottage windows that you see: *they are the eyes of wolves!*"

When twenty-five men lay dead in the expedition that enabled Bering to discover the strait which bears his name, it took a dozen men hours to bury a comrade, not because of snow and icy sand, but because hundreds of little white and blue foxes fought wildly for the body. The man who takes his life in his hand to seek for gold in Alaska finds there a grim gray wolf stalking him from afar.

On the great central plain of North America roam the coyotes. In India the dholes, or wild dogs, run in packs through the wilder jungle. Around the cities and villages prowl the scavenging jackals. The dingoes, or wild dogs, of Australia, have proved themselves a terrible menace to the sheep. Timber wolves are still native to the northern parts of Canada. Even in England, although wolves have disappeared, foxes still remain.

So wherever the eye may turn we find some member of the dog family. Brains and courage have made this widespread tribe what it is. The dogs have no sharp claws. They are blunt-nailed, so they cannot climb trees after the fashion of leopard and puma, nor pull down prey with their claws like a lion. But they have strong teeth, they have sturdy limbs, they have speed and endurance which carry them swiftly. They have the wit to combine, to hunt in concert, and they are in intelligence far above the cats, their natural enemies. They are among the most courageous, fierce and venturesome of all the animal groups.

THE UNCONQUERABLE WOLF, KING OF THE SWIFT RUNNERS

King of all the swift runners is the unconquerable wolf. His history in relation to the human family is the most impressive in all life's story. It is nothing to him that he has given hostages to man. It is nothing to him that some of his line have been won to service with human beings. He remains a splendid and terrible savage. His place is assured in the scheme of nature by reason of his audacity, his cunning, his ability to meet adversity and changing conditions. Civilization has advanced with all its strength against him. He has given ground but he has doubled back, and still resists us in lands where the arts of peace have reigned for two thousand years.

THE TERRIBLE ANIMAL PERSISTING THROUGH AGES OF PERSECUTION

In spite of the organized efforts of a population numbering scores of millions, the wolf is still with us. And he remains the most formidable and deadly animal in Europe after thousands of years of persecution. His hold on life is marvelous. He is no longer found in Great Britain, but he was there two centuries ago. The inclosure of land made it possible to slay all the wolves in the little islands; but Europe is big, and the wolf is there.

Don Quixote traveled to glorious and comic adventures in Spain, and made rare havoc with his tilting at windmills, but he might have had really good hunting had he set his lance against wolves. For the land of that delightful hero has wolves to this day, and two varieties of them. Smiling France still has these terrors, too, lurking in her wild, untilled regions. Italy, with oranges and lemons ripening in her golden valleys, looks with foreboding to the innocent-looking Apennines, for wolves hide there in summer. But when snow and famine touch the hills, they launch themselves on the plains to devour sheep and cattle. In their raging hunger they may even assail human beings.

In any year when conditions menace wild life, the same story may be traced. Take the winter of 1921–22 for example. French wolves were spreading terror in the department of Meurthe-et-Moselle. Wolves whose ancestors fled from Cæsar swarmed down into the plains of northern Italy and forgot their fear of man, attacking Cæsar's descendants. At the same time the Rumanian wolves were out in the Ploesti district, killing in one night five peasants and injuring thirty more. As for Russia, and Asia generally, a whole literature of tragedy might be written on the sad tale of life sacrificed to make wolf feasts. Thousands of them continue to happen.

WOLVES, GIANT AND PIGMY, COYOTES AND JACKALS

The European wolves are small compared with the great timber wolf of North America, and puny compared with the giant wolf of Alaska. This Alaska wolf is a superb animal, nearly six feet from the muzzle to the tip of the tail, almost thirty-two inches high, and with a head almost bear-like.

Dimensions such as these enable us to imagine the outline of some of the terrific beasts of the dog family which flourished in bygone eras—animals that attained the size of polar bears! They are gone to the kingdom of fossils, and to-day it is not the largest wolf that is most feared. It is the European species which is the fiercest. Men who have met both would rather chance meeting the giant of Alaska than the smaller animal of Spain or Scandinavia. Probably the reason is simple. European wolves have been longer in contact with humanity, and the necessity of living under fiercely competitive conditions has permitted only the most savage and audacious to survive. The fight between man and wolf in Alaska, and in the wide ranges of the timber wolf, has yet to grow intense.

In outlying districts of Canada a hard, cold winter will sometimes bring the timber wolves from their usual retreat in the northern forests. These powerful brutes are, next to the Alaska wolf, perhaps the largest and strongest of the dog tribe. Their color is yellowish or bluish gray with black markings. They usually run in packs and wear down their prey instead of jumping upon it at once. When game is scarce, these animals venture near isolated settlements and attack sheep and cattle, and sometimes children and even men. Fortunately the government bounty on wolves has encouraged hunters to rid the forests near settlements of this dangerous creature.

MYSTERY SURROUNDS THE FALKLAND ISLANDS WOLVES

All over Europe, except in Great Britain and in north and central Germany; over wide spaces of Russia; throughout the greater part of Asia as far east as Japan; and ranging throughout North America, the wolf still faces man with bared fangs. Yet, wide as is the distribution of the group, it has its curious gaps. Wolves are not found in Africa—though wild hunting dogs are there.

Down in the Falkland Islands, in conditions so inclement that the wind sometimes blows the grain out of the growing ears, there we have wolves. Ordinarily wolves move in packs, and that mainly at night. The so-called Antarctic wolves of the Falklands stalk about by daylight, singly, or at most in family groups. They do not, like the majority of the dog tribes, hide in rocks or indeed anywhere above ground, but burrow like foxes. They have distinctive features, unique fur and peculiar size, neither that of wolf nor coyote, though apparently they sprang from coyote strain.

But how came they in the Falklands? These British islands are separated by 250 miles of deep sea from Patagonia, the nearest land, and there are no other true wolves south of Mexico. The man who solves this mystery will add a first-class romance to the wonders of animal distribution. There is no other case in the world where so small and broken a landmass, far from a mainland, has ever supported so large a native animal. But it is to be feared that the Antarctic wolf will not long enjoy his supremacy, for his tribe is almost exterminated.

The coyotes, from which these mysterious wolves apparently sprang, belong entirely to the western regions of North America, half a world away, though the stress of existence has driven later generations south as far as Costa Rica, in Central America. In common with its island relative, the coyote will burrow. It travels in packs, it has the true wolf cry on the hunt, and it is not dangerous to man, except when desperately pressed by famine. Jack-rabbits, gophers, mice, prairie chickens, and even fawns of small deer provide food for these prairie scavengers. Any hen that strays from the henhouse after dark is counted fair game by the coyote. In hunting jack-rabbits these prairie wolves show an almost human intelligence. The rabbits, if pursued, run in wide circles. The coyotes hunt in pairs. One squats on his haunches while the other runs after the rabbit. True to nature, the frightened hare runs in a circle and passes close to the waiting squatting companion of its pursuer.

A PACK OF SNARLING WOLVES ON THE HUNT FOR FOOD

THE SLINKING JACKAL ACTS AS A SCAVENGER

But now we must turn to the jackal, which the East calls "the belly that runs on four feet." Asia and Africa are the home of this industrious scavenger, but Southeastern Europe still has its jackal packs. There are several species, and all can be tamed, but they are unreliable when grown up. Nearly all wild animals are. The jackals slink through life as parasites, occupying in freedom much the position that homeless mongrels have in our streets. They kill birds, young animals, and so on, and they eat anything from a lizard to a banana or a coffeeberry. But they take service with the swaggering tyrants of the wilds. When lion or tiger has made its kill and filled itself, up come the jackals to fight with the gorging vultures for the broken remains. And the curious thing is that where men go out to hunt, these timid and confiding creatures follow, just as they follow the great cats—to snap up anything left by the lord of the gun. They will finish a carcass in a night.

In Macedonia during the World War when fighting was going on in the mountains, wolf-hunting was sometimes a recreation among the officers of the Allies. But these so-called wolves were really of the jackal family. These animals were a pest because they were continually trying to dig up the soldiers' graves. Finally, at the beginning of the winter of 1916, a Serbian officer hit upon a plan for outwitting the wolves. He knew that wolves were suspicious animals and were always expecting that men were trying to trap them. So he planted stakes at each corner of the graves and around the four of them he stretched a wire about a foot from the ground. The animals feared a trap and never afterward molested a grave around which was strung the single strand of wire.

But we must not forget the service they render to towns and villages where sanitation is an unknown science. Holes are left in walls and stockades to enable the jackals to creep through at night. Anything which a jaw can master is food to the scavenger. A saddle or a pair of boots left out by accident goes the same way as a skeleton. Horrible fevers and pestilence arise in such centres of human life, and Europeans die like stricken birds. But what would happen were it not for the loathsome feastings of the nightly jackal brigades which form the only sanitary corps in such towns?

THE TERRIBLE WORK OF A WOLF WITH SEVENTY-EIGHT CAMELS

These two groups, the wolves and the jackals, have given the world the "friend of man," for they are the ancestors of the dog. What a life of terror our ancestors must have lived when teaching the enemy of the flock to become the guardian of the fold! Again and again, one fancies, there must have been scenes such as were witnessed in 1906 in a little British camp out in Seistan, on the borders of Afghanistan and Persia. A party was marking out a boundary amid hundreds of miles of wild, inhospitable country thronged with wild beasts. Jackals and wolves abound there, and, as sometimes happens to domestic dogs at home, the jackals were seized with the madness we call hydrophobia. That was bad enough, but the mad jackals attacked the wolves, and these in turn became mad. The natives, fearing that their dogs might be infected, killed them all, and so left themselves defenseless against the raging packs around their homes.

One fearful night, when the wave of animal frenzy was at its height, a pack of wolves, all raving, attacked the camp. By some miracle of courage the men in camp beat off the howling terrors, but a worse night and a worse adventure followed. A wind was blowing at 120 miles an hour, when a lone, ravening wolf, with madness heightened by the horror of the night, set out on a mission of hate. Before he could be detected he had bounded with blood-curdling howls into the little settlement. He bit like fifty wolves. He sank his envenomed teeth in the flesh of a horse; he leaped into the camel lines. Like an embodied fury he ran from animal to animal, biting each as he came to it, so that before he could be killed this one wolf had wounded with his foaming teeth no less than seventy-eight camels.

DOGS THAT EAT FRUIT AND DOGS THAT CATCH CRABS

There is one animal which is wolf in name only, and that is the maned wolf, a long-legged, foxy-eared wild dog, whose lengthy coat, exaggerated on the back of the neck, suggests a mane. Solitary, timid and inoffensive, this curious animal has Brazil, Paraguay and northern Argentina for its home; and where its borders

THE WILD WORLD COUSINS OF THE DOG

Long-eared Fox.

Maned Wolf.

Cape Hunting Dog.

Bush Dog of Guiana.

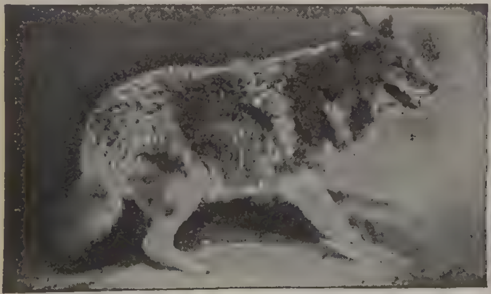
Fennec Fox.

Desert Fox.

Black-backed Jackal.

Silver Gray Fox.

Siberian Wild Dog.


Coyote or Prairie Wolf.

Siberian Wolf.

end, those of several small species of fox-like dogs begin.

Azara's dog is the title which describes this group. They are commonly called foxes, but they are more allied to wolves and jackals, and range from Colombia and the Chilean Andes down to Patagonia and Tierra del Fuego, a stretch of territory never yet reached by foxes. These dogs have a diet which embraces fruit, and that peculiarity is shared by several local races of South American animals whose crab-catching habits give them the name of crab-eating dogs. These are creatures of the jungle and forest, where another fox-like type, the colpeo, is also to be found. Another fisher of the waters is the raccoon dog, an Old World species wonderfully resembling the raccoon in build, and found in Japan, China and Amurland. Fish is only part of its diet. Members of the group which have not this commodity available sleep away the winter fasting, a unique distinction among dogs.

The true wild dogs are confined to Asia and Africa. The Asian species are big, bold animals that run in packs and hunt anything that runs on four legs. In India these wild dogs, called dholes, are very much feared. Although they hunt in packs, they hunt silently. Once they get on the trail of an animal they follow it for days. Silent and relentless, they are feared by even the powerful tiger. The African representative of the breed, the African hunting dog, is similar in habit and runs down the swiftest antelope. This is an amazing feat, but the species seems to stand among untamed dogs where the greyhound stands among the domestic breeds.

HOW TRICKY REYNARD JUSTIFIES HIS REPUTATION FOR CUNNING

Amid the snows, on the plains, in the forest and jungle, dogs are everywhere; and when we come to Brazil and Guiana we have specialized dogs, too. These are called bush dogs, extraordinary little creatures with short legs and tails. They are shy and retiring, but very fierce. Though we know little about them, they are an old variety, as we know from fossil remains in Brazilian caves.

Wide as is the range of these animals, the range of the foxes is even more extensive. The fox is at home throughout Europe and Asia, from Ireland to Japan. It is in America, and in Africa north of the Soudan and the Sahara Desert. As might be expected, a great variety of species has developed in widely differing conditions.

The common fox of Great Britain is the most astute of all wild animals in Europe. We might feel inclined to attribute its skill and cunning to its long competition with its surrounding foes. But high intelligence marks all the species. We have read how well the British example lives up to its reputation for cleverness. Its tricks to baffle hounds are almost incredible. Crossing a stream repeatedly to destroy its scent, running through flocks of sheep to hide the same fatal clue, are common tricks. Leaping from heap to heap of farm produce rather than continuing on level ground where its scent would lie, climbing seemingly impossible places, hiding where one would think a rabbit could not conceal itself—in these and a thousand other ways agile Reynard justifies his title to intelligence. Poultry, game, young lambs and fawns, insects and frogs are among his food, and his daring in getting his meals is astonishing.

FOXES OF NORTH AMERICA—RED, CROSS, SILVER AND GRAY

The red fox of North America differs slightly from the European species. The cross fox, marked with a dark cross on back and shoulders, is only a variety of the red, and the same is true of the silver fox, which is black with many hairs tipped with white. The American gray fox is a distinct species, but is smaller than the red and not so common. It is not so able to live in a cultivated country. Proof that the beautiful silver fox is only a color variety, or phase, as the scientists call it, is found in the fact that a litter of young foxes whose parents are the common red fox may be composed of red individuals and silver individuals.

Other species of foxes which deserve mention are the Arctic fox, pure white in winter, bluish gray in summer; the swift fox of our western plains, the smallest of our foxes; and the many foxes of the Old World, such as the fennec and the desert foxes. Their origin from a common ancestry is obvious. Their variety of size, color, homes and habits is another object-lesson in nature's way of making animals fit their surroundings. The same consideration applies to the whole dog tribe.

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 711.

FOXES, JACKALS AND WOLVES

North African Jackal.

Tibetan Mastiff.

American Timber Wolf.

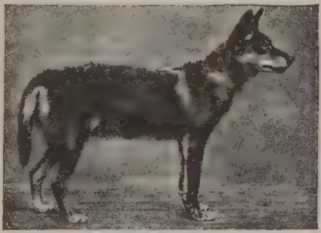
Arctic Fox.

Himalayan Fox.

Asiatic Jackal.

Wild Dog of Tibet.

Arctic Wolf.

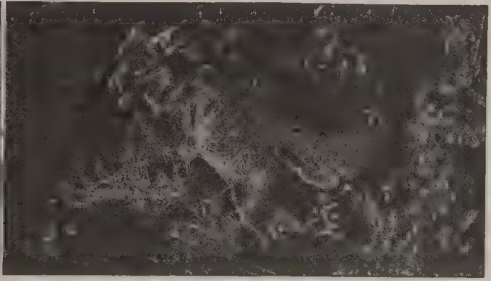


Australian Dingo.

Plains Wolf.

Indian Wolf.

Crab-eating Dog.



Common Fox.

THE ARAB'S FAREWELL TO HIS STEED

My beautiful! my beautiful! that standest meekly by,
With thy proudly-arched and glossy neck, and dark and fiery eye!
Fret not to roam the desert now with all thy winged speed;
I may not mount on thee again—thou'rt sold, my Arab steed!

The Book of POETRY

OF course poetry is too big a subject for us to master in a short time; we can only hope just now to get into the way of liking to read and study it. But that is in itself a great thing to do, as youth is the time to form all good habits, and this is clearly a good one. We have already made some little progress toward becoming real lovers of poetry, and we are now to see why it is that we cannot read poetry in quite the same way as we read prose.

HOW TO READ POETRY

CONTINUED FROM 492

JUST as poetry has a different purpose from prose, is a different thing, in fact, so must we read it differently. We do not read prose, as a rule, in order to remember every word of every sentence. The reason is that in prose the *story* told by the words, the *thought* expressed, is what we wish to remember, rather than the *words* themselves.

With poetry it is not quite so, though even the story or the thought is still of first importance. No matter how strange, no matter how beautiful, merry or sad, the story the poet has to tell us, it must be told in words which are themselves so chosen and arranged that we can remember them and read them over again for their own charm.

Many phrases are full of poetry, by which we mean that the very words give wings to our imagination and seem to carry our thoughts into Wonderland. Tennyson, the great poet, when he was a little boy, used to be fond of repeating those simple words from one of our popular hymns, "Far, far away." They filled his mind with strange dreams of wonder, these simple little words.

If we read such a charming poem as The Pied Piper of Hamelin, printed on pages 224–227, we shall see what is meant by the value of words in poetry. This is only a tiny story that could all be told in a hundred words. The poet takes 303 lines to tell it; yet we would not wish it shorter. We are so pleased with the quaint words and merry phrases themselves. Here, then, is something quite different from ordinary prose, and we must read it differently.

The chief difference is not so much in the actual words, though they are very important, but in what we call the rhythm. This means the movement of the verses, the pauses, stops, the rise and fall of emphasis, the quickening or the slowing of the lines. If we look at the second verse of The Pied Piper, we shall find we have to pause in the middle of the first line and at the end of it, and again at the end of the second and third lines; but only slightly at the end of the fourth, and not at all at the end of any of the other lines in the verse, except the last. This is how the poet contrives to quicken the movement of his story.

Think of the fine sounds that can be made by an orchestra. Well, the great poets can make us hear in imagination just such wonderful music.

We have, therefore, in reading poetry to *think* the sound of the verses, as well as the meaning of them, for the sound is part of the sense. If we altered the words we should lose something of the poet's meaning, just as we should destroy a painter's picture by putting a touch of yellow where he had put a touch of red. In prose we might alter words and phrases without injuring or destroying the writer's story.

Let us, then, try always, by giving to each word, each line and verse, its due sound and emphasis, to reproduce in our own minds the *rhythm* which the poet has intended to run through his poem like a thread of gold on which his thoughts are strung like beads. In a word, we must not *scamp* the reading of poetry, but read it slowly at first, with care to get at the value of each phrase, its meaning, and then again more quickly to get the effect of the whole, and so many times over, for all good poetry is meant not merely to be read, but to be re-read.

THE LAMB

William Blake, the writer of this curiously beautiful little poem, was born in 1757 and died in 1827. He wrote many poems full of simple beauty, but he is admired chiefly on account of his weird poems about the spiritual world, for which he himself drew many strange pictures.

LITTLE lamb, who made thee?
Dost thou know who made thee?
Gave thee life, and bade thee feed
By the stream and o'er the mead;
Gave thee clothing of delight,
Softest clothing, woolly, bright;
Gave thee such a tender voice,
Making all the vales rejoice?
Little lamb, who made thee?
Dost thou know who made thee?
Little lamb, I'll tell thee;
Little lamb, I'll tell thee;
He is callèd by thy name,
For He calls himself a lamb.
He is meek and He is mild,
He became a little child.
I a child, and thou a lamb,
We are callèd by His name.
Little lamb, God bless thee!
Little lamb, God bless thee!

LUCY

In reading poetry we should always try to be in the mood of the poet. If it is clear that he is serious, let us read him seriously. For it is very easy to make fun of serious thoughts if we care to do so. William Wordsworth was clearly serious in the following little poem, the first two verses of which are very fine; but the simple pathos of the last verse is very easily turned into parody by writers who like to make fun of the serious poets.

SHE dwelt among the untrodden ways
Beside the springs of Dove,
A maid whom there were none to praise,
And very few to love:

A violet by a mossy stone
Half-hidden from the eye!—
Fair as a star, when only one
Is shining in the sky.

She lived unknown, and few could know
When Lucy ceased to be;
But she is in her grave, and, oh!
The difference to me!

FAIRY SONG

There is nothing so difficult to catch as a fairy! Who, indeed, did ever manage that? Nor is it easy to catch the meaning of this fairy song by John Keats, one of the great English poets. It has this lesson for us, however: not to be sad at the waning year, the withering flower, for in the heart of the tree is the sap that will feed the new buds of the next spring, and even in the winter these are already being slowly born. It is a song of hope and cheerfulness.

SHED no tear! O, shed no tear!
The flower will bloom another year.
Weep no more! O, weep no more!
Young buds sleep in the root's white core.
Dry your eyes! O, dry your eyes!
For I was taught in Paradise
To ease my breast of melodies—
Shed no tear.

Overhead! look overhead!
'Mong the blossoms white and red—
Look up, look up. I flutter now
On this flush pomegranate bough.
See me! 'tis this silvery bell
Ever cures the good man's ill.
Shed no tear! O, shed no tear!
The flowers will bloom another year.
Adieu, adieu—I fly, adieu,
I vanish in the heaven's blue—
Adieu, adieu!

THE SLUGGARD

Isaac Watts, who was born in 1674 and died in 1748, was a famous minister of the Gospel, who wrote many fine hymns and many very poor ones. As a poet he does not take a high rank; but he was very earnest, and always sought in his rhymes to teach good lessons. There is good teaching and a touch of humor as well in these familiar verses by him.

'TIS the voice of a sluggard; I heard him complain,
"You have waked me too soon; I must slumber again";
As the door on its hinges, so he on his bed
Turns his sides, and his shoulders, and his heavy head.

"A little more sleep and a little more slumber";
Thus he wastes half his days, and his hours without number.
And when he gets up he sits folding his hands,
Or walks about saunt'ring, or trifling he stands.

I pass'd by his garden, and saw the wild brier,
The thorn and the thistle grow broader and higher;
The clothes that hang on him are turning to rags,
And his money still wastes till he starves or he begs.

I made him a visit, still hoping to find
That he took better care for improving his mind;
He told me his dreams, talk'd of eating and drinking,
But he scarce reads his Bible, and never loves thinking.

Said I then to my heart: "Here's a lesson for me,
That man's but a picture of what I might be;
But thanks to my friends for their care in my breeding,
Who taught me betimes to love working and reading."

NIGHTINGALE AND GLOW-WORM

William Cowper was a great lover of animals, like all people of gentle nature. In this pretty little poem he tells us of a fancy that we could wish might be true, and though it is only a fancy, we are the better for having our minds thus engaged with tender thoughts for the "lower animals."

A NIGHTINGALE, that all day long
Had cheered the village with his song,
Nor yet at eve his note suspended,
Nor yet when eventide was ended,
Began to feel, as well he might,
The keen demands of appetite.
When, looking eagerly around,
He spied far off, upon the ground,
A something shining in the dark,
And knew the glow-worm by his spark;
So, stooping down from hawthorn top,
He thought to put him in his crop.
The worm, aware of his intent,
Harangued him thus, right eloquent—
"Did you admire my lamp," quoth he,
"As much as I your minstrelsy,
You would abhor to do me wrong
As much as I to spoil your song.
For 'twas the self-same power divine,
Taught you to sing, and me to shine;
That you with music, I with light,
Might beautify and cheer the night."
The songster heard his short oration,
And warbling out his approbation,
Released him, as my story tells,
And found a supper somewhere else.

THE FOUNTAIN

James Russell Lowell, the writer of these happy lines, which express so well the feeling that comes to us in watching the play of a fountain on a summer day, was a famous American poet and humorist. He was born in 1819 and died in 1891.

INTO the sunshine,
Full of the light,
Leaping and flashing
From morn till night!

Into the moonlight,
Whiter than snow,
Waving so flower-like
When the winds blow!

Into the starlight,
Rushing in spray,
Happy at midnight,
Happy by day!

Ever in motion,
Blithesome and cheery,
Still climbing heavenward,
Never aweary;

Glad of all weathers,
Still seeming best,
Upward or downward
Motion thy rest;

Full of a nature
Nothing can tame,
Changed every moment,
Ever the same;

Ceaseless aspiring,
Ceaseless content,
Darkness or sunshine
Thy element;

Glorious fountain!
Let my heart be
Fresh, cheerful, constant,
Upward like thee!

BOY'S SONG

There is real joy of country life in this song of rural boyhood, by James Hogg, the Scottish shepherd poet, who was known as the "Ettrick Shepherd," having been born at Ettrick, in Selkirkshire, in 1770. He wrote many poems, chiefly of country life, that are still favorites, and died in 1835.

WHERE the pools are bright and deep,
Where the gray trout lies asleep,
Up the river and o'er the lea,
That's the way for Billy and me.

Where the blackbird sings the latest,
Where the hawthorn blooms the sweetest,
Where the nestlings chirp and flee,
That's the way for Billy and me.

Where the mowers mow the cleanest,
Where the hay lies thick and greenest,
There to track the homeward bee,
That's the way for Billy and me.

Where the hazel bank is steepest,
Where the shadow falls the deepest,
Where the clustering nuts fall free,
That's the way for Billy and me.

Why the boys should drive away
Little sweet maidens from the play,
Or love to banter and fight so well,
That's the thing I never could tell.

But this I know, I love to play,
Through the meadow, among the hay;
Up the water and o'er the lea,
That's the way for Billy and me.

THE BURIAL OF SIR JOHN MOORE

Sir John Moore was a great soldier who won the battle of Coruna, in Portugal, on January 16, 1809, but was killed on the battlefield. This solemn, dignified poem describing his burial was written by an Irish clergyman, Charles Wolfe, who died in 1823, and, although he wrote other poems, this is the only one that is remembered; but it is sure to live forever.

NOT a drum was heard, not a funeral note,
As his corse to the rampart we hurried;
Not a soldier discharged his farewell shot
O'er the grave where our hero we buried.

We buried him darkly, at dead of night,
The sods with our bayonets turning;
By the struggling moonbeam's misty light,
And the lantern dimly burning.

No useless coffin enclosed his breast,
Not in sheet or in shroud we wound him;
But he lay like a warrior taking his rest,
With his martial cloak around him.

Few and short were the prayers we said,
And we spoke not a word of sorrow;
But we steadfastly gazed on the face that was dead,
And we bitterly thought of the morrow.

We thought, as we hollowed his narrow bed,
And smoothed down his lonely pillow,
That the foe and the stranger would tread o'er his head,
And we far away on the billow!

Lightly they'll talk of the spirit that's gone,
And o'er his cold ashes upbraid him;
But little he'll reck, if they let him sleep on
In the grave where a Briton has laid him.

But half of our heavy task was done
When the clock struck the hour for retiring;
And we heard the distant and random gun
That the foe was sullenly firing.

Slowly and sadly we laid him down
From the field of his fame fresh and gory;
We carved not a line, and we raised not a stone—
But we left him alone with his glory.

ALL'S RIGHT WITH THE WORLD

This is a splendid outburst of joy at the goodness of God. In these eight short lines Robert Browning has done more than others in long poems to convey the delight of being alive that comes to us on a beautiful morning in spring.

THE year's at the spring
And day's at the morn,
Morning's at seven,
The hill-side's dew-pearled,
The lark's on the wing,
The snail's on the thorn,
God's in His heaven—
All's right with the world.

THE RAINBOW

In this little poem by Wordsworth occurs the famous line "The child is father of the man," which means that, what our character is in childhood, so will it be when we grow up.

MY heart leaps up when I behold
A rainbow in the sky;
So was it when my life began,
So is it now I am a man;
So be it when I shall grow old,
Or let me die!
The child is father of the man;
And I could wish my days to be
Bound each to each by natural piety.

ARAB'S FAREWELL TO HIS STEED

The Arab's devotion to his friend the horse is famous. But who, indeed, that is not a brute can fail to love his faithful horse, which serves him meekly and will always do its best for its master? The Hon. Mrs. Norton, one of the three lovely daughters of Richard Brinsley Sheridan, the dramatist, chose a fine subject in this poem, and she treated it with dramatic fitness and true feeling. It is a good poem to recite.

MY beautiful! my beautiful! that standest meekly by,
With thy proudly-arched and glossy neck, and dark and fiery eye!
Fret not to roam the desert now with all thy winged speed:
I may not mount on thee again—thou'rt sold, my Arab steed!

Fret not with that impatient hoof, snuff not the breezy wind.
The farther that thou fliest now, so far am I behind.
The stranger hath thy bridle rein—thy master hath his gold;
Fleet-limbed and beautiful, farewell!—thou'rt sold, my steed, thou'rt sold.

Farewell! Those free, untired limbs full many a mile must roam,
To reach the chill and wintry sky which clouds the stranger's home.
Some other hand, less fond, must now thy corn and bed prepare;
The silky mane I braided once must be another's care.

The morning sun shall dawn again, but never more with thee
Shall I gallop o'er the desert paths, where we were wont to be;
Evening shall darken on the earth, and o'er the sandy plain
Some other steed, with slower step, shall bear me home again.

Yes, thou must go! The wild, free breeze, the brilliant sun and sky,
Thy master's home—from all of these my exiled one must fly.
Thy proud dark eye will grow less proud, thy step become less fleet,
And vainly shalt thou arch thy neck thy master's hand to meet.

Only in sleep shall I behold that dark eye glancing bright;
Only in sleep shall hear again that step so firm and light;
And when I raise my dreaming arm to check or cheer thy speed,
Then must I, starting, wake to feel—thou'rt sold, my Arab steed.

Ah! rudely then, unseen by me, some cruel hand may chide,
Till foam-wreaths lie, like crested waves, along thy panting side;
And the rich blood that's in thee swells in thy indignant pain,
Till careless eyes, which rest on thee, may count each starting vein.

Will they ill-use thee? If I thought—but no, it cannot be,
Thou art so swift, yet easy curbed; so gentle, yet so free;
And yet, if haply, when thou'rt gone, this lonely heart should yearn,
Can the hand that casts thee from it now command thee to return?

Return!—alas, my Arab steed! what shall thy master do,
When thou, who wert his all of joy, hast vanished from his view?
When the dim distance cheats mine eye, and through the gathering tears
Thy bright form, for a moment, like the false mirage appears?

Slow and unmounted shall I roam, with weary step alone,
Where with fleet step and joyous bound thou oft hast borne me on;
And, sitting down by that green well, I'll pause and sadly think,
"'Twas here he bowed his glossy neck when last I saw him drink!"

When last I saw thee drink!—away! The fevered dream is o'er!
I could not live a day and know that we should meet no more!
They tempted me, my beautiful! for hunger's power is strong—
They tempted me, my beautiful! but I have loved too long.

Who said that I had given thee up? Who said that thou wert sold?
'Tis false!—'tis false! my Arab steed! I fling them back their gold!
Thus, thus, I leap upon thy back, and scour the distant plains!
Away! who overtakes us now may claim thee for his pains!

THE UNSEEN PLAYMATE*

Robert Louis Stevenson in this poem, which is reprinted from A Child's Garden of Verses by permission of Messrs. Longmans, Green & Co., has written a beautiful piece of fancy. He almost makes us see this unseen playmate. He means, of course, the gentle spirit of happiness and of true childhood joy, which makes each little boy or girl never feel lonely, as it should be present in each one.

WHEN children are playing alone on the green,
In comes the playmate that never was seen.
When children are happy and lonely and good,
The Friend of the Children comes out of the wood.

Nobody heard him and nobody saw,
His is a picture you never could draw;
But he's sure to be present, abroad or at home,
When children are happy and playing alone.

He lies in the laurels, he runs on the grass,
He sings when you tinkle to musical glass;
Whene'er you are happy and cannot tell why;
The Friend of the Children is sure to be by!

He loves to be little, he hates to be big,
'Tis he that inhabits the caves that you dig;
'Tis he, when you play with your soldiers of tin
That sides with the Frenchmen, and never can win.

'Tis he when at night you go off to your bed,
Bids you go to your sleep and not trouble your head;
For wherever they're lying, in cupboard or shelf,
'Tis he will take care of your playthings himself!

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*From The Complete Poems of Robert Louis Stevenson, copyright, 1905, 1923 by Charles Scribner's Sons. By permission of the publishers.

THE STARS

In the poem The Star, printed on page 1138, we have verses written specially for children. But Barry Cornwall, whose real name was Bryan Walter Proctor, wrote this little poem of The Stars for all readers, young or old. In it he has caught the quiet beauty of the night, and you will notice that instead of expressing wonder as to what the stars may be, he is content to think of them as among the glories of God's world, that fill our souls with reverence and peaceful joy.

THEY glide upon their endless way,
For ever calm, for ever bright,
No blind hurry, no delay,
Mark the Daughters of the Night;
They follow in the track of Day,
In divine delight.

And oh! how still beneath the stars
The once wild, noisy Earth doth lie;
As though she now forsook her jars,
And caught the quiet of the sky.
Pride sleeps; and Love (with all his scars)
In smiling dreams doth lie.

Shine on, sweet orbed souls, for aye,
For ever calm, for ever bright:
We ask not whither lies your way,
Nor whence ye came, nor what your light.
Be, still—a dream throughout the day,
A blessing through the night!

EXCELSIOR

Written by the famous American poet Henry Wadsworth Longfellow, this poem may seem strange at first reading. We must know that the word "excelsior" comes from a Latin word meaning "ever upward"; then the poem is quite clear. The youth wished to excel, and he heeded no warnings, no inducements to remain in comfort and safety, but went striving upward and at last suffered death in the snowstorm. But to the end he stood by his motto, which is a noble one, and, whether we fail or succeed, it is always a noble thing to try to excel. That is the real meaning of the poem.

THE shades of night were falling fast,
As through an Alpine village passed
A youth, who bore, 'mid snow and ice,
A banner with the strange device:
Excelsior!

His brow was sad; his eye beneath
Flashed like a falchion from its sheath,
And like a silver clarion rung
The accents of that unknown tongue:
Excelsior!

In happy homes he saw the light
Of household fires gleam warm and bright;
Above, the spectral glaciers shone,
And from his lips escaped a groan:
Excelsior!

"Try not the pass!" the old man said,
"Dark lowers the tempest overhead,
The roaring torrent is deep and wide!"
And loud the clarion voice replied:
Excelsior!

"O stay!" the maiden said, "and rest
Thy weary head upon this breast!"
A tear stood in his bright blue eye,
But still he answered with a sigh:
Excelsior!

"Beware the pine-tree's withered branch!
Beware the awful avalanche!"
This was the peasant's last good-night!
A voice replied, far up the height:
Excelsior!

At break of day, as heavenward
The pious monks of Saint Bernard
Uttered the oft-repeated prayer,
A voice cried through the startled air:
Excelsior!

A traveler, by the faithful hound
Half buried in the snow, was found,
Still grasping in his hand of ice
That banner with the strange device:
Excelsior!

There, in the twilight cold and gray,
Lifeless, but beautiful, he lay,
And from the sky, serene and far,
A voice fell, like a falling star:
Excelsior!

YE MARINERS OF ENGLAND

When Thomas Campbell wrote this famous song, one of the finest patriotic songs in any language, all warships were still made of wood—England's "wooden walls" they were called—but though they are now built of massive steel plates, the feeling that inspires the brave sailors is still the same as in the days of Nelson, who won the great battle of Trafalgar when Campbell was twenty-eight years old.

YE mariners of England,
That guard our native seas;
Whose flag has braved, a thousand years,
The battle and the breeze!
Your glorious standard launch again,
To match another foe!
And sweep through the deep,
While the stormy winds do blow;
While the battle rages loud and long,
And the stormy winds do blow.

The spirit of your fathers
Shall start from every wave!—
For the deck it was their field of fame,
And ocean was their grave:
Where Blake and mighty Nelson fell,
Your manly hearts shall glow,
As ye sweep through the deep,
While the stormy winds do blow;
While the battle rages loud and long,
And the stormy winds do blow.

Britannia needs no bulwarks,
No towers along the steep;
Her march is o'er the mountain waves,
Her home is on the deep.
With thunders from her native oak
She quells the floods below,
As they roar on the shore,
When the stormy winds do blow;
When the battle rages loud and long,
And the stormy winds do blow.

The meteor flag of England
Shall yet terrific burn;
Till danger's troubled night depart,
And the star of peace return.
Then, then, ye ocean warriors,
Our song and feast shall flow
To the fame of your name,
When the storm has ceased to blow;
When the fiery fight is heard no more,
And the storm has ceased to blow.

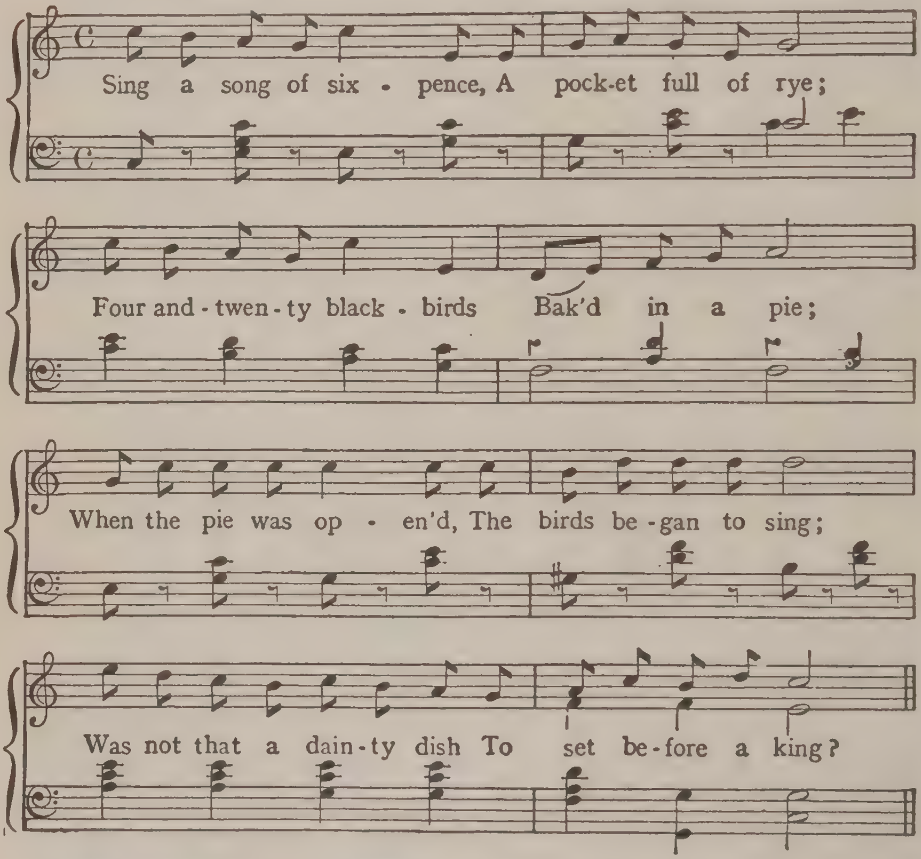
SING A SONG OF SIXPENCE

SING a song of sixpence
  A pocket full of rye;
Four-and-twenty blackbirds
  Baked in a pie;

When the pie was opened
  The birds began to sing;
Was not that a dainty dish
  To set before a king?

The king was in his counting-house
  Counting out his money;
The queen was in the parlour
  Eating bread and honey;

The maid was in the garden
  Hanging out the clothes,
Down came a blackbird
  And snapped off her nose.


Sing a song of six - pence, A pock-et full of rye;
Four and - twen - ty black - birds Bak'd in a pie;
When the pie was op - en'd, The birds be - gan to sing;
Was not that a dain - ty dish To set be - fore a king?

MY house is red—a little house,
A happy child am I:
I laugh and play the livelong day,
I hardly ever cry.

I have a tree, a green, green tree,
To shade me from the sun;
And under it I often sit,
When all my work is done.

My little basket I will take,
And trip into the town.
When next I'm there I'll buy some cake,
And spend my bright half-crown.

I LOVE little pussy,
Her coat is so warm,
And if I don't hurt her,
She'll do me no harm.

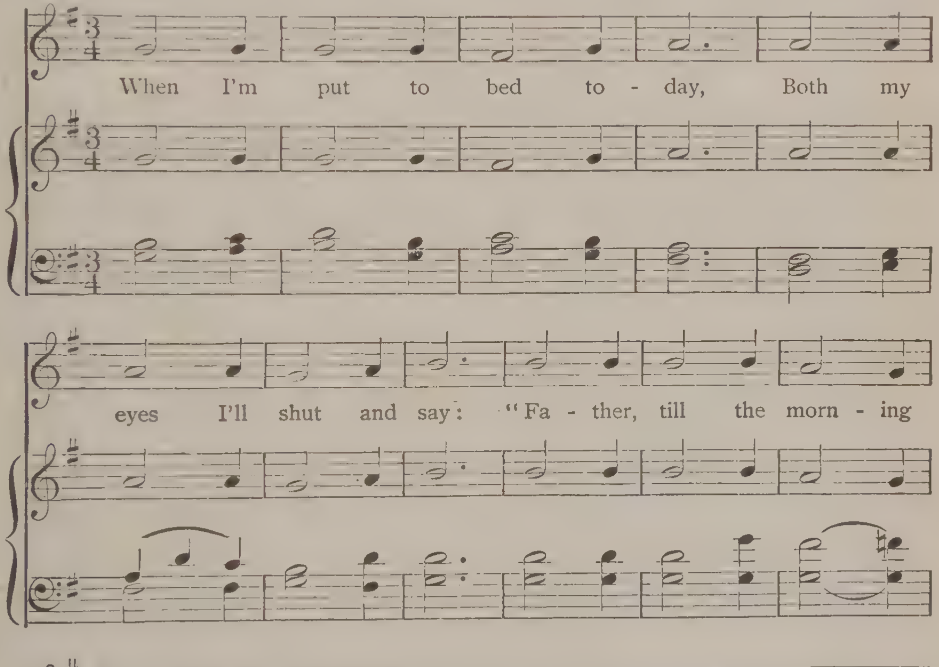
So I'll not pull her tail,
Or drive her away,
But pussy and I
Very gently will play.

She will sit by my side,
And I'll give her her food,
And she'll like me because
I am gentle and good.

A CHILD'S EVENING PRAYER

Words by Alfred P. Graves.

Music by permission of Messrs. Schott & Co.


When I'm put to bed to - day, Both my
eyes I'll shut and say: "Fa - ther, till the morn - ing
light, Watch my lit - tle bed to - night!

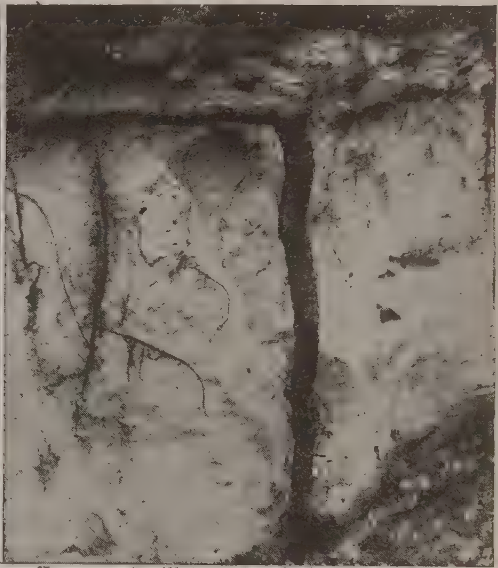
"All the people in all lands
Take unto Your loving hands;
Old and young and great and small,
From all danger guard them all!

"Give the sick ones gentle sleep,
Dry the eyes of those that weep,
And, please, leave the moon to light
All poor travelers through the night!"

THE EXTRAORDINARY WORK OF A TREE

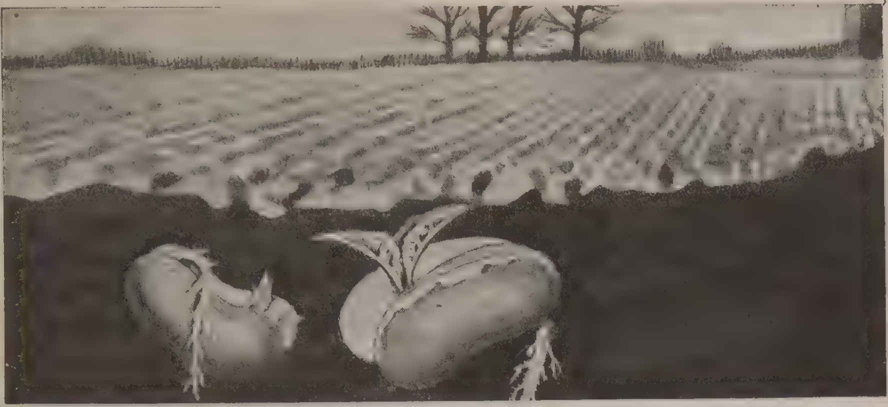
The amazing root that feeds and anchors a tree.

Little roots formed by the ivy for climbing.



How a root will turn sharply in search of food.

A motor car inside the trunk of a tree.



Always the young shoot goes up and the root goes down.

HOW PLANTS WORK FOR THEIR LIVING

CONTINUED FROM 510

BECAUSE plants spend but little energy in the form of movement, we are apt to underrate their working powers.

Only some of the simplest plants swimming about in the water show any sign of locomotion, but the majority are very busy. As among animals, the business is mainly twofold: caring for self and caring for others. It is the first of these that we have to do with here. It means capturing raw materials, manufacturing these into carbon compounds—sugar and starch, fat and oil, and, above all, *proteins* (like the gluten of wheat); and using this self-made food for upkeep, for growth and for storage.

A great part of the work of green plants is devoted to increasing the amount of living matter; to growing, in fact; and we cannot look at an oak tree fifty feet high without feeling that to build this up from an acorn the plant must have done an immense amount of work. Some of the Big Trees of California (the Sequoias) are about 300 feet high, and this is near the limit, for there is a limit beyond which a tree cannot grow without tumbling down. We sometimes see healthy trees laid prostrate because, when a strong wind came, their foundations would not stand the strain. Some of the great seaweeds, such as oarweed, grow to a very great length without having any hard tissues for support, but in these cases the heavy plant is floating in the water.

The most ancient plants lived probably in shallow water near shore, and when we look at the great beds of seaweeds exposed at low tide, we get some idea of the primeval vegetation—after ages and ages of the simple free-swimmers. The first use of the root was to anchor the plant so that it could not be swept away into deep and dark water. That is the use of the so-called roots of seaweeds to-day.

But land vegetation, when it began, meant, among other things, the need for a new water-absorbing organ. This is the main use of the root. A seaweed absorbs the water by the general surface of its fronds, and similarly the beautiful bladder-wort of bog pools, having no roots, must absorb water by its leaves. This is not possible in ordinary land plants, and thus the chief use of the root is to absorb water and salts from the soil. Of course, when the stem of the plant rises high, as in trees, the roots serve as foundations, or anchors. Another use of roots is to form a storehouse for reserve food supplies. This is plainly seen in the case of edible roots, like carrots.

The tip of a root is clear and delicate. It remains ever young and growing; it is always feeling its way farther into the soil. Its growing-point is protected by a root-cap which saves the delicate, rapidly dividing cells from being punctured by sharp particles in the soil. A little way behind the growing part we see the origin of numerous root-hairs which are of fundamental importance to the plant. They are the water-absorbers.

There are often many hundreds of root-hairs to a square inch, and they grow like delicate fingers into the gaps among the soil-particles. They are outgrowths of the very living skin-cells of the root, and their use is to absorb the soil-water which occurs in delicate films round the minute particles. The wall of the finger-like processes that probe and bend in the gaps is very delicate, so that water passes readily through it into the denser cell-contents. Moreover, toward the tip of the root-hair the cell-wall is soft and gummy, so that a soil-particle may almost be said to be glued to it.

HOW THE ROOT-HAIRS WORK THEIR WAY INTO THE DARK SOIL

For the most part what the plant gets from the soil passes in by the delicate root-hairs, and no one root-hair lasts very long. They shrivel away as the part of the root from which they arise gets older, and new ones are formed nearer the tip. It is important to understand that the growing of the root deeper into the ground is always just at the tip, below the youngest root-hairs; otherwise the growing would tear the root-hairs from their grip of the soil-particles.

In the core of the young root there is a column of pipes, or vessels (wood and bast), surrounded by a slightly corky sheath. There is another corky sheath just below the outermost cells that form the root-hairs. Between these two slightly corky sheaths there is the rind, or cortex, of the root, a sort of intermediate reservoir for the absorbed water. But as the root gets older, the rind often becomes unimportant, or disappears altogether. What is most important is this, that the water captured by the root-hairs passes into the wood-elements of the root's core and then into similar elements in the stem, until it finally reaches the leaves.

Before we leave the root it is of interest to notice two or three other points. Often as the root grows older it shortens as a whole, and this gives a plant a stronger hold in the ground. With the growth of the plant as a whole there is an increase in the total size of the root-system, and this is in great part due to the formation of new rootlets. It is very striking to find a boulder that has been cracked and has then allowed roots of plants to grow into it, with the result that it is eventually split in two. Then we may see the whole root-work of a heather plant much larger than the bush above ground. Rootlets begin in the core of the root and push their way through the tissue to the surface where they emerge as branch roots.

THE STRANGE WAYS IN WHICH THE ROOTS CLING AND HOLD UP WATER

Finally, there are roots that do strange things. Thus the little brownish air-roots of the ivy are used for climbing purposes, binding the stem tightly to tree or wall. In some of the plants of tropical forests, which live quite off the ground, the roots absorb water-vapor from the moist air. In the orchid which yields vanilla some of the roots serve as tendrils, and others dangle. They are able to absorb dew and rain, for they are surrounded by a sheath of large empty cells opening by pores to the outside, very much like the water-storing cells of the bog-moss.

In the bog-moss more than half the cells are dead and empty, but are kept from collapsing by delicate spiral and circular bands. Twenty times the plant's own weight of water may be stored in these cells, and this is used by the living elements which the others inclose.

THE BRICKS AND RAFTERS AND VENTILATORS OF THE LEAF

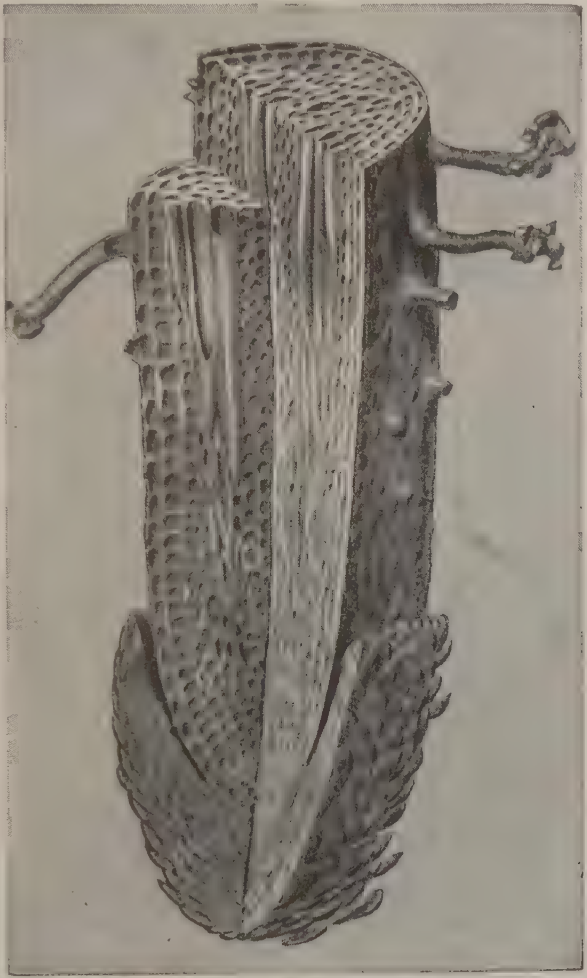
Thus, when there is prolonged drought the bog-moss is still able to flourish. It is also in part to be thanked for holding-up the rain that falls on the hills, so that the springs are slow in becoming dry. The use of bog-moss for soaking up moisture from wounds is well known. It is interesting to find the same sort of device in situations so different as the bog-moss and the vanilla root.

Beyond any doubt, the green leaf is the most marvelous laboratory in the world. As a famous botanist says, "leaves are so many workshops full of machinery worked by sun-power. They can do what the most learned chemist has not yet been able to do."

The green leaf is also the most important laboratory in the world, for all animal and human life practically depends on the nutritive material which it builds up.

A leaf is a sheet of living tissue, sometimes as thin as tissue-paper, as in a young beech leaf; sometimes as thick as leather, as in a rubber plant. Some leaves are so small that we can hardly see them with the naked eye, while some palm leaves are six feet long.

No self-supporting higher plant can get on without leaves unless an expanse of green is attained in some other way—notably by having a large area of green stem. Thus in cactuses the leaves are turned into spines, and the whole stem is green. What look like floating leaves in the case of the little duck-weed on the surface of the pool—the smallest but one of all common flowering plants—seem to be tiny flattened shoots.



THE BUSY FACTORY IN THE ROOT OF A TREE

Here, in a highly magnified picture-diagram, we see the wonderful structure of a root, and the scene of a root's astonishing activities. The delicate growing-point is protected by a hard cap. Immediately within the outer wall are the layers of cells which bring down food from the leaves, and next to them are the quill-like tubes which bring up food from the soil. In the heart of the root are the cells which store the starch from which the root nourishes itself and grows. At the top we see a few of the countless root-hairs which absorb salts and water from the soil.

To understand the work of leaves we must know a little about their microscopic architecture. Think of a leaf hardly thicker than this paper, and even there is room for no small degree of structure. The upper surface is covered by a layer of skin-cells, and the outer walls of this are often thickened to protect the delicate, more intensely living units below. The skin-cells often bear non-conducting hairs, giving the leaf a woolly surface; or they may be, as it were, varnished with protective wax.

On the lower side of the leaf there is another skin (an epidermis), but every here and there on this surface there are numerous pores called *stomata*, which allow of an exchange of gases between the leaf and the air. If the leaf is floating on the surface of a pond, as in the case of a water-lily, there would be no use in having the openings on the lower surface which touches the water; and we are not surprised to find them on the dry upper surface.

Now between the two skins there is the middle green tissue of the leaf. Toward the upper surface the cells are arranged like bricks or posts, and often in two layers. They are called palisade cells. Toward the under surface there are more green cells, less closely fitted together, and the gaps between them communicate with the openings, or stomata. This is called the spongy tissue. The green color of the palisade layers and the spongy layers is due to numerous green disks (chlorophyl corpuscles) lying in the living matter of the cells.

Finally, the leaf is supported by a

framework or network of veins, which form the skeleton of the leaf. If we are not familiar with the appearance, we should collect some skeleton leaves, and, after washing them, hold them against the light to see the beautiful lace-work. The wood-elements of bundles that support the soft tissue of the leaf are also of use as conducting pipes. By them the water and salts from the roots are distributed to the green cells of the leaf, and the nutritive organic materials manufactured in the green tissue of the leaf are carried downward, as "elaborated" sap, to the stem and the roots. It is useful to take a few leaves of the plantain from the side of the road, and break the stalk to see the four or five firm strands which are thus exposed.

THE GREAT CHEMICAL LABORATORY IN THE CELLS OF THE LEAF

The all-important fact is the presence of the green cells in the middle tissue of the leaf, with thousands of chlorophyl disks turning their edges to the light. They are able, with the help of the energy of the sunlight, to split up the carbon dioxid of the atmosphere, freeing the oxygen and fixing the carbon in the form of carbon compounds. This building-up by the power of light is what is called *photosynthesis*.

The conditions for this photosynthesis, which is the most characteristic work of green plants, are thus summed up by Professor F. O. Bower in his masterly book on The Botany of the Living Plant.

1. Chlorophyl must be present in the cells which carry on the building-up process.
2. Carbon dioxid must be accessible to them.
3. Light must reach them, and in sufficient intensity.
4. Temperature must be within certain limits.
5. Mineral salts must be available.

"These necessary conditions being met," says Professor Bower, "the constructive process consists in the absorption of carbon dioxid, fixation of the carbon, release of free oxygen, and the appearance in the active cells of material formed from the carbon which has been fixed."

STARCH AND SUGAR MADE BY SUNLIGHT AND THE GREEN LEAF

The first visible product of the leaf's industry is starch, but this is preceded by the formation of formaldehyd and sugar. Cover a green leaf with a plate of tinfoil or cardboard with the letters S-T-A-R-C-H cut out on it, and keep the plant in the dark for two days so that any starch already formed may pass down into the stem. Expose the leaf to sunlight for a morning, and we can easily prove that the building-up process has been working only in the illumined parts.

For if the leaf is removed, boiled for a minute in water, then decolorized with alcohol and stained with iodin solution, the word Starch will be seen in purple letters on the exposed parts of the leaf, while the shaded parts will be yellow. The fact is that the starch is formed in the *illumined* chlorophyl disks.

If a shoot of Canadian waterweed is fixed in a glass tube, with the cut end upward and exposed to light, bubbles of gas are seen escaping from the cut surface. It is easy to capture these and prove that they are largely oxygen. They are the result of the splitting-up of the carbon dioxid captured from the water. By counting the bubbles and using glass of different colors it is not difficult to show that the red, orange and yellow rays are much more important than those of the blue or violet.

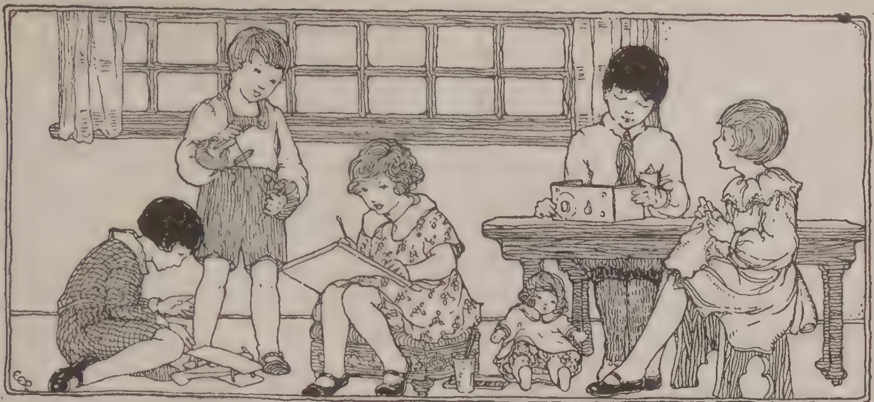
THE TINY MOUTHS OF THE LEAF AND HOW THEY BREATHE

Every living creature must take in oxygen and give off carbon dioxid, for living cannot go on without slow combustion (or oxidation). If we have in a room at night a lighted candle, a sleeping cat and a green plant, all three are taking in oxygen, burning away carbon compounds, and giving off carbon dioxid.

It is in the dark that we must study the breathing, or respiration, of plants, for in sunlight the breathing process is quite disguised or masked by the feeding process. The little openings (stomata) on the under-side of the leaf are breathing-pores, and it is also by these important apertures that water-vapor is given off to the atmosphere. The stomata open and close in an automatic way, so that, though too much water is not given off, there is yet enough to keep the up-current from the roots steadily going on.

To sum up: Water with salts in solution is absorbed by the roots. It passes by the stem to the leaves, where it meets carbon dioxid which the leaves have absorbed. Starch and other materials are formed. They steal away to the place where they can be used and stored.

THE NEXT STORY OF PLANT LIFE IS ON PAGE 743.



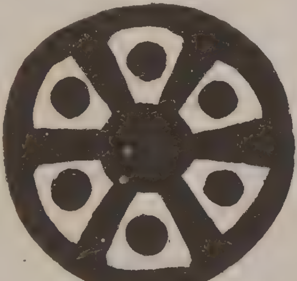
LEARNING THE ART OF BLOCK PRINTING

CONTINUED FROM 518

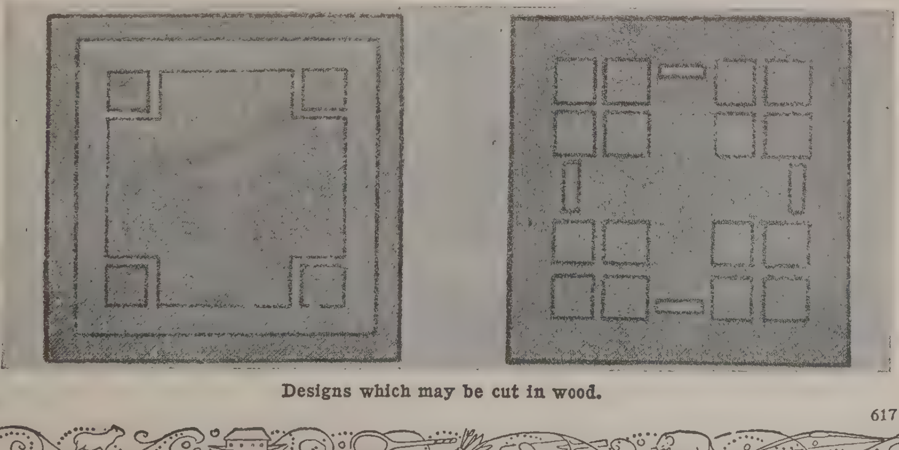
IT is believed that the Chinese and Japanese were among the very first peoples to become skilled in block printing. That these wooden blocks were used to print books in China as early as the sixth century A.D., long before the art of printing was learned in Europe, has become an established fact. Possibly you have seen some of these early prints in a museum or private collection.

Even to-day boys and girls find much profit and pleasure in preparing and block printing designs for booklets, posters, portfolios, table-runners, bags, tray-cloths, curtains and the like. Although any flat surface of paper or cloth may be "wood-blocked," linoleum is often substituted for wood in cutting the block, as it is more easily carved.

The design (see suggestions for two tile designs or patterns) for any unit may be transferred to either a wood block or a linoleum block (a block of soft wood, about 1 inch or less in thickness, to which a piece of linoleum, about ⅛ or $\frac{3}{16}$ inch in thickness, has been glued). In either case the wood or the linoleum is cut away to a depth of about $\frac{1}{16}$ inch from those parts of the design which are not to print. For this a knife or chisel may be used if you do not have access to a set of woodcarving tools. A pad of cloth is made by folding a strip of the material so that four or more thicknesses are piled one upon another. Over this pad is poured a mixture of water-color paints and liquid glue. A few drops of water may be added to thin the mixture in case it becomes too thick. By using this ink pad and the wood block or linoleum block the unit design is printed as planned. Sometimes slight changes in the



Combination of block and stick printing.



Designs which may be cut in wood.

original plans will help it to appear to better advantage. A suitable color scheme should be used. The color used in any printed unit should always be harmonious with the marginal lines and also the lettering, if included.

You are referred to page 130, in Volume One for suggestions concerning the uses of colors in printing. If desired, block printing and stick printing may be combined as shown. In this case the block printing is done first; then touches of brighter color may be added by means of the sticks. This makes various combinations possible.

HOW TO REMOVE STAINS

DID you ever get a grass stain on your "bestest" dress and wonder what to do? Or did you ever find a spot of ink or paint on your blouse and have to hunt everywhere for a remedy? Every girl ought to know how to remove spots that are likely to appear. Here will be given suggestions that may be followed in case you want to know how to remove a stain. In every case be careful.

It is always best to attack stains as soon as possible after they are made, and always before they are laundered. Never use hard water or strong acids. Before trying to remove them, first find out the nature of the stain. The remedy that will remove one kind of stain might set another kind. Warm water and soap will generally remove any grease stain, but will often set a fruit spot. Boiling water is a safe remedy for nearly every variety of stains, and rarely sets a stain. Water is one of the best remedies, and does not injure the material, whereas chemicals may hurt the fabric. If a chemical must be used, remember to rinse the material in plenty of clear water. If an alkali, like lime, is used to remove stains, then an acid, like vinegar or lemon-juice, should be put on the spots. Several different remedies will be given for each stain, so that you will probably be able to find the material for one of the suggestions right in the house.

GRASS STAINS

IF a white dress is injured by a grass stain, use a little clear ammonia, but do not use it on colored goods. Wash the ammonia out with plenty of clear water and soap. For colored goods, rub a little lard on the stain, and wash it out with soap and water, and you will be surprised how quickly it disappears. Another remedy is kerosene. Saturate thoroughly with kerosene, and then wash carefully. Still another suggestion is cream of tartar, which may be moistened and rubbed on the stain. Pure alcohol is often recommended, and molasses is said to be a good remedy, if it is well rubbed into the stain and then is carefully washed out.

PAINT AND VARNISH STAINS

A SPLASH of paint spells ruin to a pretty dress unless you know what to do for it. As soon as you have such a misfortune, rush for the bottle of turpentine. This will be effective on a fresh paint stain. If the stain has been allowed to stand, first scrape off the surface with a knife, then apply a little vaseline to soften the paint, and then use the turpentine. While the paint is fresh, you may find that rubbing with a piece of cheesecloth or some material like the dress will cause the stain to disappear. Use alcohol on fine and delicate material, and use turpentine on the coarser goods.

For varnish on a dainty white dress, first try rubbing it with alcohol, and then saturate it in turpentine. A little chloroform will remove any trace of discoloration that may remain.

If the paint has been allowed to dry on the material, there is still a little hope for its removal. Take a little ammonia and an equal amount of turpentine, and apply it to the spot. Wash it out afterward, and saturate the spot again. If you do this several times you may find that the spot will gradually disappear.

SCORCHED SPOTS

ISN'T it aggravating to have a blouse come back from the laundry with an ugly yellow scorched spot just where it shows most! Rub the spot with moistened Ivory soap, and put the garment in a sunny window. Sometimes the yellow discoloration will disappear if the dress is simply placed in the sun to bleach. A thin mixture of starch and water may hasten its removal.

IRON RUST

IF you are so unfortunate as to find a number of iron rust spots on a handkerchief or dress, do not worry about the stains, for they are easy to remove. Simply get a little cream of tartar and rub it on the spots, letting it remain for an hour or more. Then wash the place, and if the spot has not quite vanished, rub again with the cream of tartar. On colored goods or wool, a special application of citric-acid solution will remove the trouble. Muriatic acid or oxalic acid may be used if we take great care and apply it very sparingly, just touching the spots. Salts of lemon is also good if the spot is small.

IODINE

IODINE is often used as a remedy for cuts, sprains and bruises, and as a result sometimes our fingers get an ugly spot or two. Iodine stains may be removed from the fingers or from material if we apply pure alcohol and then use lukewarm water and plenty of soapsuds.

CHOCOLATE STAINS

A STAIN from chocolate demands a different treatment. Cold water removes, while warm water sets a stain of this kind. Sprinkle the spot with a little powdered borax, and then soak it in cold water for 15 minutes. This loosens the chocolate from the linen fibres, and it will soon dissolve if rubbed gently. If discoloration still remains, pour boiling water over the spot.

ACID STAINS

IF any common acid, like lemon-juice or vinegar, is spilled on a dress, it may change the color. If you sponge the spot lightly with a little ammonia in some water (1 tablespoon of ammonia to 4 tablespoons of cold water) you may be able to restore the color.

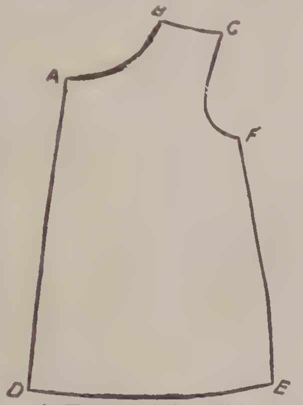
WHAT TO DO WITH A GIRL'S WORKBASKET

2. THE DOLL'S FIRST LITTLE GARMENT

WE have learned how to do the different stitches that are needed to make dolls' clothes, so now we should be able to undertake the fine stitching for the garments that we are going to make.

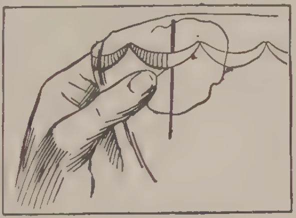
We will start with the little chemise. If you look at picture 1, you will see that the pattern is quite simple, and very easy to cut out if you read this article carefully.

Draw the pattern to fit the size of your doll on a piece of paper, and mark it A, B, C, D, E, F, like the sketch. Then take a piece of fine, soft calico, or, better still, nainsook, twice the length and twice the width that you want the little chemise to be, allowing enough over for seams and hem. Now fold the material in half, and then fold it in half again. When you have done this, the shape of the material should be *as it was before*, only smaller. You have now in your hand four folds of material which are longer than they are broad.



1. How to cut the pattern.

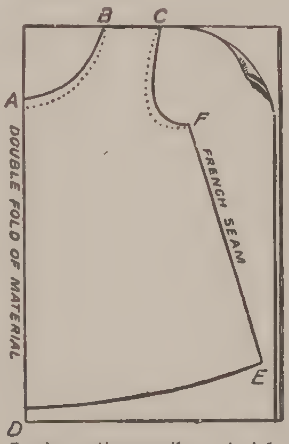
Before going any further we should be sure that the two single folds of material are at the top, and the double fold at the side, for this is important, as we shall see. If this is not quite clear to you, look at picture 2, which shows the material folded. Lay this down on the table in the position shown in the picture, and lay the pattern on it. Pin the pattern to the material before it can slip out of place, putting one pin at the top, another at each side, and one at the bottom; then take a pair of scissors and cut all round the outlines of the pattern, except the parts between B and C (this is the shoulders), and between A and D (this is the middle of the chemise, as you will see when you open the material out after it has been cut).



3. Buttonhole scallops.

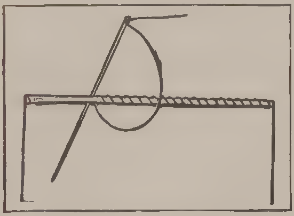
When you are cutting, you must remember to leave a ½ inch for the double seam under each arm, and 1¼ inches for the hem at the bottom.

Take off the pattern and unfold the material. The two sides of the little garment are now shaped and held together by the uncut folds of the shoulder. If you look at your own little chemise, you will find that the front of the neck is cut lower than the back, but in the doll's pattern both back and front are alike, are they not? Now turn to picture 2 again, and you will see that there is a dotted line below the one between A and B. The line between A and B represents half the back of the neck, and the dotted line half the front. So, to get the front, take your scissors and cut out the material a little, being careful to slope out more at the centre than at the sides. Then slope out each little sleeve (between C and F) in the same way. Just now we spoke of half the pattern. Nearly all patterns are cut out in halves—that means that nearly all garments have, of course, two sides, or two parts, which are exactly alike, and it is far easier to get these exact if we double the material, lay the pattern on it, and cut them both at once. This is why we always, or nearly always, speak of a pattern as being *half the back* or *half the front*, and so on.



2. Laying pattern on the material.

Now that these points are quite clear, we must begin to sew our chemise together. Before starting the sewing we must be sure that our hands are spotlessly clean, for on its neatness and cleanliness depends the success of our work. To look well, needlework must be kept quite fresh, or its charm will be gone, however neat the work may be.



4. The whipping stitch.

Thread a short needle and begin with the seams on each side, joining them either by running and felling them, or by a French seam. If we have forgotten how to do this, we must turn to page 338 of our book.

The next thing to do is the hem at the bottom. Turn up the material about 1¼ inches. You will remember that we allowed 1¼ inches when we cut the material. The ¼ inch is for the first little fold, and the inch will be the width of the hem. Measure 1¼ inches all round; turn this down and tack it to keep it in place. A good way to measure the hem and to be certain that it is quite even is to get a piece of stiff paper—or a visiting card is better—measure an inch on it, snip it with the scissors to mark it, and use it as you would use a tape measure. When your hem is even, fold the rough edge under ¼ inch and tack it again, and then hem it round with tiny, neat little stitches.

Now what are we going to do with the top and the sleeves? If we have been practicing all the stitches which we learned the other day, we shall be able to do some small buttonhole scallops round the neck and sleeves, in which case we shall have the daintiest little ornament that one could wish for. If you look at picture 3, you will see how the material is cut out in large scallops all round for the buttonhole stitches to be worked on. The picture shows how the stitches should be narrow at the top of each scallop and get wider in the middle. If you cannot get this quite even, draw a faint line, like the one in the picture, and work over it carefully.

But if this is too difficult, we can make a little hem and sew on the end of it a piece of pretty Valenciennes lace. As the neck is round, and not straight, it will not be very easy to fold the hem in the usual way; but if you try to roll the edges and make only a tiny hem, you will find it will not be nearly so difficult.

5. The finished garment.

Now for the lace. This should be first gathered in a way that is called "whipping"—that is, we turn the edge in a little and make little over-and-over stitches like those shown in picture 4, and then pull it up, so that it makes a little frill. When the lace is pulled up full enough—do not let it be too full—sew it on to the edge of the hem with tiny stitches, just as you "whipped" the lace. In sewing the lace to the chemise, do not put the two back to back and then sew, but draw them together as you would sew together the two edges of a hole in a glove. This is the only way to get the lace to set quite flat.

And now your little chemise should look just like the one shown in picture 5.

The same pattern can be used to cut out a petticoat; but, of course, we must cut it longer than the chemise. We must also take care not to cut out the neck in such a low round. If you look at picture 2 you will see broken lines outside the neck and lower edges showing where the edges of a petticoat should be. This kind of petticoat we call a princess petticoat, and it can be made either in a soft woolly material or in white cotton. Sometimes it is made of silk or satin and is used then as a lining for a very thin or lacy dress.

ARRANGING FLOWERS FOR THE HOUSE

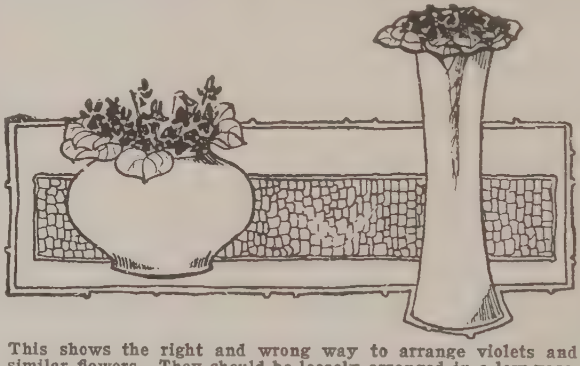
THE world has paid every woman a charming compliment. It has credited all of us with the ability to make our surroundings beautiful. Have you not read in many books that the heroine possessed a magic touch? When she had been there the room seemed to show an extra daintiness, the place wore an added charm, an air of comfort and coziness that it did not possess before. But, unfortunately, the novel gave no precise direction as to how she did it.

These things are not arrived at by instinct. The good fairy who deals out the birth-gifts is not so lavish as we are led to suppose, and seldom gives to anyone so big a gift that there is nothing left to learn. She just gives a little bit—just enough to show it is there—and one has to learn the rest.

We shall not be able to learn here everything that our favorite heroines are supposed to know, but only a few things about one simple part of the subject—how to arrange flowers.

I wonder if you have ever thought that the size, shape and color of the vase is a most important point? For instance, daffodils, which are heavy flowers, should always stand in strong china—for preference, green glazed ware. There is something so strong and sturdy about their growth that they need a good support and plenty of water; so don't put them into frail china vases that will topple over with a breath of wind because they are top-heavy.

Also remember how the daffodil grows. How many leaves go to one daffodil? Hundreds! Well, you cannot get hundreds into a vase, but you can get a good many, and you will find the flowers look far finer with a plentiful supply of leaves, because—and this point applies to every kind of blossom—they *grow like that.*



This shows the right and wrong way to arrange violets and similar flowers. They should be loosely arranged in a low vase, and not cramped up in a high vase where they can hardly be seen.

Suppose you had a lovely jarful of white lilies, but no leaves, you would not think of putting in some thistles, would you? And yet many people who try to arrange flowers do things that are just as absurd and wrong as this. Be careful how you mix blooms; be quite sure they go well together, or it is much better to put them in separate jars. It does not always happen that all varieties of one kind of flower look well together. Two geraniums, one a vivid scarlet and the other a magenta pink, would give a terrible effect if they were put in one vase. After all, most flowers do look best by themselves—although one often has to make use of those one has.

It is a good rule to keep to one color and white, or only to use several shades of one color. In each case have plenty of green. Also remember that the green leaf of the plant itself always suits the blossom best, so that if you cannot get that, use some other leaf as much like it as possible in color and size.

Another important point to remember is the position of the flowers. Some flowers were made to look down upon, while others are more charming when one has to look up at them. So, when placing them, try to think which is the better position.

If you have an azalea plant in bloom, don't put it on a high table, but stand it on something very low or on the floor, so that you can see down on to the lovely masses of flower, and not only get a view of the stalks and backs. Flowers like bluebells, which droop their heads, will look better up high, say, on the mantelpiece, because then one can see the beauty they seem to be shyly hiding.

Don't despise wild flowers. They can be made to look lovely in the house. Select the best blossoms and keep one kind together, and have them always in big bunches. Buttercups, with a few strands of green wild oats rising above them, look beautiful in a big low jar. But they should be stood in the sun, for half their charm lies in the glossy shine on their petals, and this is best seen when the sun is beaming down upon them.

Some people gather a few buttercups, put them in a tall thin vase, and stand them in a dark corner, and then they wonder why they look so dreary. It is only because they went to work the wrong way, and did not think.

Have you noticed how very beautiful some of the seed-pods are? Use some occasionally among your blossoms. Nasturtiums, sweet peas and roses have the right sort for decoration. They give a variety and uncommonness to quite an ordinary bunch, and in the autumn they can often be made into a decoration by themselves. Think how charming a large bunch of red rose-berries can be, and honesty, you know, is a seed-pod too.

Now we come to the question of bowls. Big bowls of flowers have a charm which a mere vase can never possess. Think how often our artists put a bowl of flowers in a picture! Not everyone can manage to get the blooms to stand up properly; they have an annoying trick of falling to the edge and leaving a hole in the middle. This will not happen if you put a little jam-jar in the centre of the bowl first, and then fill both with water; but be sure your jar is not higher than the bowl, or it will show.

Marguerites carelessly arranged in a wide bowl.

This is the same bowl, with a jam-jar inside it, hidden by the flowers, which holds the stems together and gives a prettier effect.

Remember that no woman who is really refined allows ugliness near her. These little things take such a short time to do, and really give a great deal of pleasure.

A still larger flower-holder can be made very simply. Get a section of ordinary glazed drainpipe and paint it dark green or earth-brown, or indeed any shade you wish. Then find a common unglazed flower pot which will fit into the painted drainpipe. Be sure that the flower pot stands in a saucer so that water will not drip through to the floor or window ledge. When we choose flowers to stand in this drainpipe container we must bear in mind that the lines of the pipe are very straight, almost severe. Such lines suit certain flowers and do not suit others.

And a mistake we must avoid is the placing of small flowers in a large bowl or pot, or putting large flowers in small bowls. In both cases the result is a clumsy effect. A little flower is lost in a big vase.

HOW TO TEST FOR PURE SILK

YOU have seen silk sales advertised from time to time, but do you know that these silk garments are truly bargains? Do you wish to perform an interesting experiment to find out more about pure and loaded silk? If so, secure a piece of cheap ribbon (taffeta will do) and also one of undyed Chinese silk.

As you touch a lighted match to the cheap ribbon you will be surprised to find that it will burn slowly or smolder, but without a flame. After it has burned you will note a charred piece remaining which in very cheap silk even shows the weave of the textile. As you burn the Chinese silk you will note quite a contrast in the large flame and also in the brittle substance remaining.

This interesting comparison should give the background for the following information. Salt of sodium or salt of tin is often used in dyeing fabrics. If salt is placed in a bath for dyeing silk, the fibre rapidly takes up the salt. In case a great amount of salt is added, the silk fibre is found to take up enough of it to become loaded with metal to the extent of many times its own weight. This explains why cheap silks are so stiff as well as why you saw no flame when you burned the loaded silk. Loaded silks of the cheaper varieties become shopworn easily and wear out quickly. Consequently they are not cheap at any price.

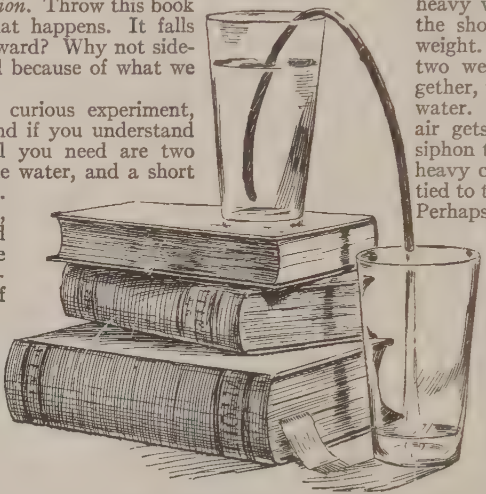
If you want to buy silk for a dress, ask for a small sample of the material. Then test it.

THE MAGIC OF A GLASS OF WATER

FOR every mystery there is an explanation. We are sometimes a very long time finding the explanation, but the more we know about the true meaning and the properties of things, the more mysteries we are able to explain; and as soon as we can explain a mystery, it ceases to be one.

Look at your face in a mirror. Why does the mirror show everything in front of it? Because it has the property of *reflection*. Throw this book into the air and see what happens. It falls downward. Why not upward? Why not sideways? It falls downward because of what we call *gravitation*.

Now we will make a curious experiment, which you will understand if you understand what gravitation is. All you need are two tumblers, or cups, a little water, and a short piece of rubber tubing. Any sort of tubing will do, but it should be small and thin like the tubing of the old-fashioned feeding-bottle. Put a tumbler of water on a box or some books on a table—on anything that will cause it to stand a few inches higher than it would stand if you were to put it on the table.



1. A simple siphon, showing how water flows upward.

Now put an empty tumbler on the table near the high tumbler. The tumbler holding water will now be higher than the empty tumbler. Put the end of the rubber tubing into the glass with water. Let it go down in the water. Now put the other end of the tubing into your mouth, and suck some of the water up. When the tubing is full of water, squeeze the end of the tube which you have in your mouth. Take it between your finger and thumb, holding it tightly, and put this end into or over the empty tumbler, still keeping the other end of the tubing below the surface of the water in the high tumbler. The part of the tubing dangling over the side of the full tumbler should be longer than the part inside the full tumbler.

Now if you take away your fingers, thereby letting the lower end of the tubing open, the water will begin to flow, and will continue to flow until the high tumbler is empty, or until the water in the high tumbler is below the end of the tubing up which the water has been flowing. You have made what is called a *siphon*—not the kind that holds soda water, for this is not a true siphon, but what men of science and engineers call a siphon.

Can you explain what has happened? Suppose you take a string, tying to one end a large stone or weight and to the other end a small stone or weight, and suppose that you put the middle of the string over a wheel or a smooth rail. You know what will happen: the heavy stone or weight will fall and pull up the little weight until it follows it down the other side of the wheel or rail.

The water in the long leg of the tube is like the heavy weight, and the water in the short one is like the small weight. But you say that the two weights would be tied together, while water is not tied to water. That is true; but unless air gets into the tube of your siphon the effect is just as if the heavy column of the water were tied to the light column of water. Perhaps it would make it clearer if I were to say that the heavy column of water falls down and *sucks* up the lighter column. The light column of water then becomes the heavy column, and sucks up more water, and so on until all the water possible has been sucked up and has flowed down the tube.

We shall make another experiment — how to make a penny rise up in water. It will not really rise up, but it will seem to do so, and the experiment is a very curious one. It shows that we do not see through water quite in the same way as we see through air.

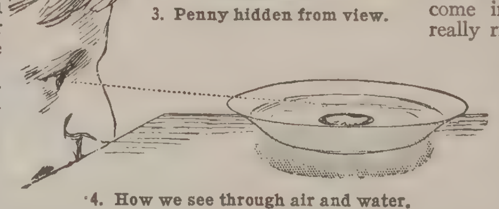
Put a saucer on a table or on a sideboard, and put a penny in the middle of it. It will then look as shown in picture 2.

2. Penny in saucer.

Now get someone to look at it. Ask him to sit a little lower until the penny is just hidden by the rim of the saucer. He will then see the saucer but not the penny. It will be like picture 3.

3. Penny hidden from view.

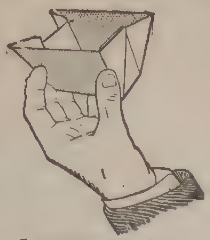
Now, while your friend sits still, pour water into the saucer. Do it very steadily so as not to spill the water. The penny will come into sight. It does not really rise. It is the water that makes it seem to do so. This is because, when you look through air, you see in a straight line. When you look through air and water you see along two lines, as shown in picture 4.



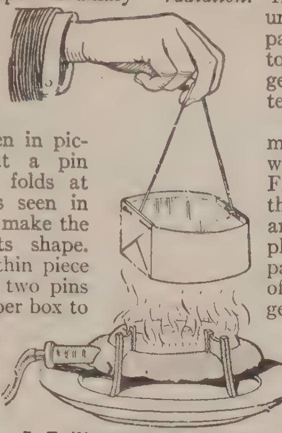
4. How we see through air and water.

This curious property of water is called *refraction*. You will know more about this property of water when you begin to study the subject which we call *physics*.

Another experiment shows yet another curious thing. To talk about a paper saucepan seems absurd, but it is not so ridiculous as it sounds.

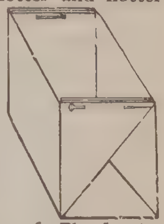


5. Making the box.



7. Boiling water in the box.

We can really make water boil in a paper saucepan without much difficulty. First, we must make the saucepan. Take a piece of paper—ordinary writing paper will do. Fold it over something of square or oblong shape, as seen in picture 5. Put a pin through the folds at the sides, as seen in picture 6, to make the box keep its shape. Now put a thin piece of string around the parts of the two pins inside the box, and hang up the paper box to something, or hold it in your hand, as shown in picture 7. Pour some water into the paper box until it is almost full. Do it very gently, so as not to break the paper box. Put a lamp, a candle, or a gas-flame under the box. The paper will not burn, as we might expect, but the water will get hotter and hotter until it boils. This result, which seems strange, is caused by the water, which will not allow the paper to retain the heat, but draws it to itself. This effect is due to what is called *radiation*. Instead of getting hotter and hotter until it burns, the paper gives its heat to the water, which gets hotter and hotter until it boils.



6. The box finished.

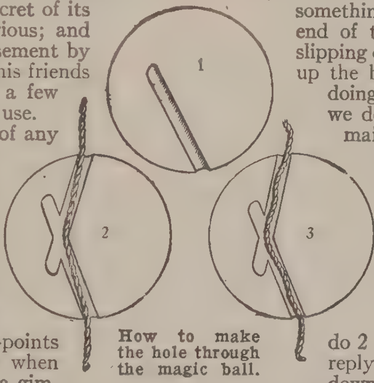
Another piece of magic is connected with a glass of water. Fill the glass up to the top with water, and on the water place a piece of tissue paper ¼ inch wide and of the same length as the needle. Very gently drop the needle upon the paper. After a moment or two take a pencil and very carefully push the paper down toward the bottom of the glass. If you have pushed slowly, you will find that the needle is left floating on the surface of the water! The explanation is that the molecules of the water surface cling together. The paper sinks, but the clinging molecules support the needle.

THE BALL THAT ANSWERS QUESTIONS

ONE of the most interesting toys is a ball that seems to count and answer questions. To people who do not know the secret of its manufacture it is very mysterious; and any boy can derive much amusement by making one, and showing it to his friends after he has practiced with it a few times and become expert in its use.

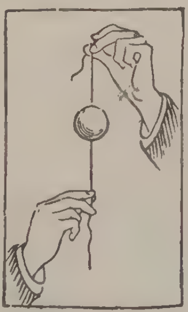
First, we get a wooden ball, of any size we like, but not too tiny. A croquet-ball will do nicely, or one about the size of a golf-ball; but, whatever size it may be, it had better be of wood.

The first thing to do is to mark upon the outside of the ball two points exactly opposite each other. In most wooden balls we find two centre-points that the wood-turner has used when making the ball. Then we use a gimlet, and make a hole in the ball, but *not* in a straight line toward the other point. Picture 1 shows how the hole is made; it is not through the centre of the ball, but to one side. The hole is not made to go right through the ball, but it must go more than halfway.



How to make the hole through the magic ball.

Now we bore another hole from the opposite point. This is the only difficult part, for the second hole must be made so that it goes right into the first hole, and the result is that we have a continuous hole right through the ball, but not in a straight line. Pictures 2 and 3 show how the hole would look if we were to cut the ball right through the middle. But, of course, we are not going to cut the ball through; the pictures are only to help us to make the hole properly.



4. Holding the ball.

Now we put a string through the hole from side to side, and after doing so we had better put something—say, a button—on each end of the string, to prevent it from slipping out of the hole. Now, if we hold up the ball as the boy in picture 4 is doing, pulling the string tightly as we do so, we find that the ball remains fast at any part of the string we like. Let the string loose just a little, and the ball begins to slip down. Again pull it tight, and again the ball rests.

Now we can ask the ball questions. Hold the string tightly, with the ball at the top of it. "Ball, how many do 2 and 3 make?" we ask; and, for reply, the ball takes 5 short steps down the string. Of course, we are making it do so by making it tight and loose as we wish. Then we say: "Ball, I am going to ask you some questions. If you mean yes, move once; if you mean no, move twice." We can ask any questions we like, and the ball can always answer them if we are allowed to hold it up by the string. A little practice will enable us to move the ball without anyone's detecting how we do it.

If the ball is large, a long string may be used. One end should be held in the right hand and the right arm is stretched at full length from the side. The other end can be held under the foot. It is a good idea to start the ball a couple of times near the hand and let it slide freely down the string. Then suddenly say "Stop" and pull the string.

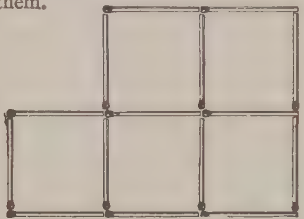
KNOTTY PROBLEMS TO SOLVE

THE problems given below may be performed with burnt matches or toothpicks which should be of the same length and same thickness.

1. Take 11 burnt matches or toothpicks and place them so as to make 9 of them.

2. Arrange 15 sticks so as to form 5 squares of equal size as seen in the picture, and then remove 3 sticks so as to leave only 3 instead of the 5 squares.

3. Take 9 sticks and place them so as to make 3 dozen of them.

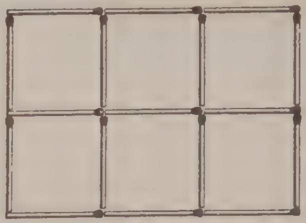


4. Take 3 sticks and place them so as to make 4 of them.

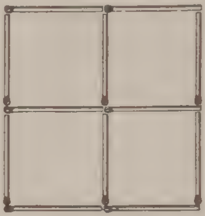
5. Place 3 sticks in such a position that they will make 6.

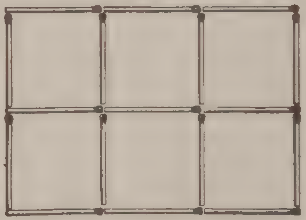
6. Arrange 17 sticks on the table so as to make 6 squares as shown in the illustration, and then by taking away 5 sticks, leave 3 squares only.

7. Arrange 12 sticks on the table so as to make 4 squares as shown in the picture, then after removing 4 sticks place them so as to make 3 squares of the same size as the first squares.



8. Arrange 17 sticks on the table so as to form 6 squares as shown in the picture, and then take away 6 sticks so as to leave only 2 squares remaining.





ANSWERS TO PROBLEMS ARE GIVEN IN THE SECTION BEGINNING ON PAGE 891.

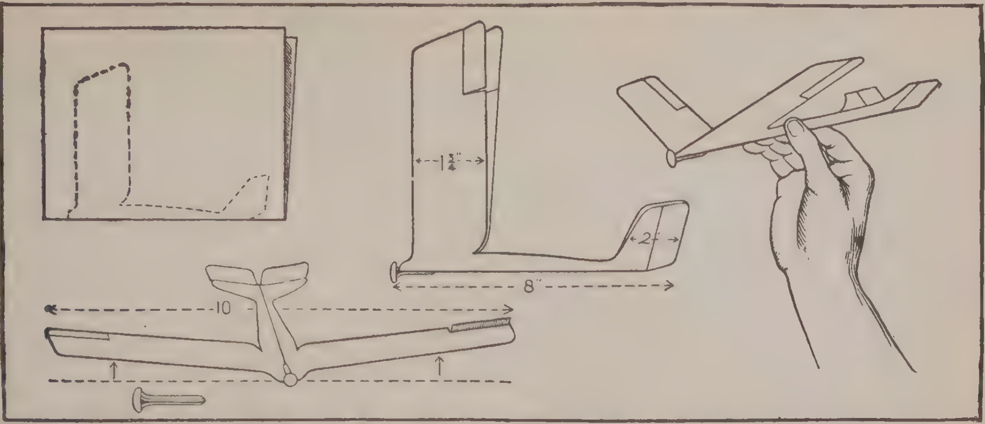
HOME-MADE TENTS

BOYS and girls miss much during their summer vacations if they haven't tents in their back yards where they may play from time to time. Some children save their money to buy canvas tents, but others prefer to use their savings for other things. Then, many children get much pleasure from making tents which serve their purposes quite as well as the manufactured ones.

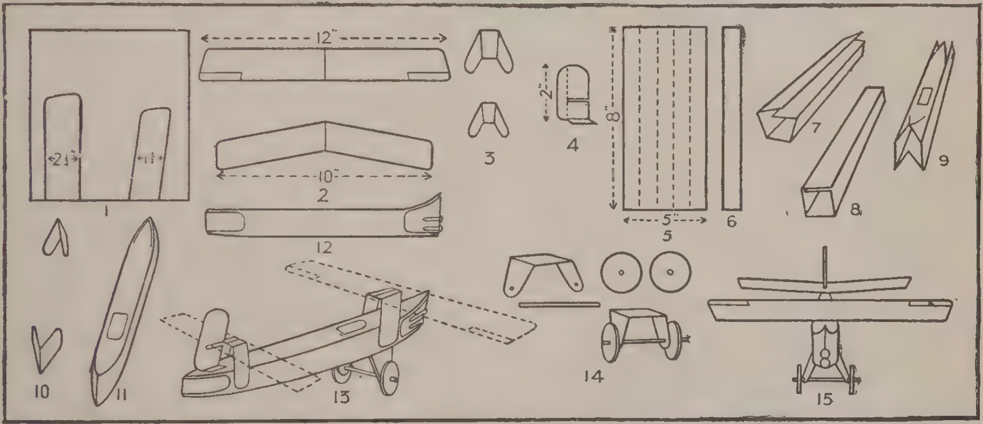
Home-made tents vary from those which are quickly constructed as a sort of makeshift to those which take some time but are more permanent. The simple directions for making any one of these tents are easily followed and may be modified to meet your convenience. An easily constructed but cozy two-room tent was recently made by two boys whose homes are separated only by a backyard fence. They planned to make and share this very serviceable tent. First they secured four strong poles, each of which was a few feet longer than the height of the fence. Two of these posts were set upright in the ground on one side of the fence about eight feet from the fence itself, and the other two were placed on the other side in just the same position. The canvas (old blankets might be used) which they found was first cut down to the right size and then securely nailed to the posts, thus forming a top or roof. Next, two old sails were secured and cut into straight curtains for the sides of the tent. Strips of wood were placed in the hem so that they might be rolled up easily.

Still another home-made tent was built by a boy and his sister who conceived the idea of using discarded clothes-poles (bean-poles would have served the same purpose) instead of saplings. These poles were also set in the ground and fastened at the top as described in the directions for the preceding tent. For covering this tent these children selected about ten yards of yellow (brown is even better) denim, although it may be made larger if desired. First, the lengths were cut to fit the poles; that is, they were pointed at the top in order that they might be stitched together. Tape was then sewed at the top, the centre and the base of each seam (inside) so that it could be tied around the poles to hold the denim covering in place. The tent was finally decorated by painting Indian pictures on it with red and green stencil colors. Their stencil patterns were confined entirely to flowers and animals. For stenciling suggestions you are referred to page 336 in Volume One.

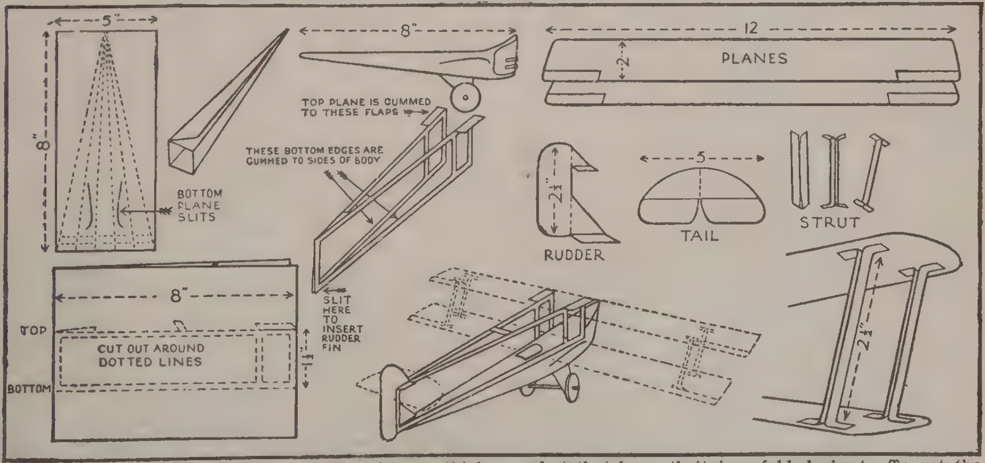
MODEL GLIDERS THAT A BOY CAN MAKE



Take a piece of thin cardboard, or stiff paper, about 1 foot long and 9 inches wide, and fold it across the middle. Then draw the outline of half the glider, as indicated by the dotted line, and, keeping the card folded, cut out the shape. Make cuts for the ailerons, and fix a paper-fastener to the nose as a weight.



This is a more advanced type of glider. 1. The cardboard folded double and the measurements of the two planes. 2. The planes opened out. 3. Plane supports. 4. Rudder, with flap for pasting to fuselage. 5. Cardboard for the fuselage. The dotted lines show shallow cuts for folding. 6. Cardboard, when folded. 7. Ready for pasting. 8. After pasting. 9. The ends and cockpit. 10. Paper for ends. 11 and 12. The fuselage. 13. Supports and rudder in position. 14. Chassis with match for axle. 15. Glider with paper fasteners as weights.


5"
8"
BOTTOM PLANE SLITS
8"
TOP PLANE IS GUMMED TO THESE FLAPS
THESE BOTTOM EDGES ARE GUMMED TO SIDES OF BODY
12
2"
PLANES
2¼"
RUDDER
5
TAIL
STRUT
8"
TOP
CUT OUT AROUND DOTTED LINES
BOTTOM
1"
SLIT HERE TO INSERT RUDDER FIN
2¼"

The cardboard in the first diagram is only one thickness, but that beneath it is a folded sheet. To get the upward tilt on the front of the fuselage, push up the lower and the upper side of the end about one inch.

HOW BREAD IS MADE

HAVE you found out just how the bread you eat at each meal is made? Perhaps your mother or someone else in the household makes the bread at home. Perhaps the bread you eat is made in a bakery. In either case this important food is made from flour, water, yeast, and some salt and sugar. These are all mixed together to make a dough. The yeast is used to make the dough rise so it will be both soft and light; while the salt and the sugar both flavor the bread and give it a better taste. With an ordinary yeast cake the bread is started in the evening. First, the yeast cake is broken and put into warm water. Then, flour and water are mixed, after which the yeast and water are stirred into this mixture. This is then covered up and placed in a warm room for the night.

The next morning more flour and water are mixed, and the yeast that was made the previous evening is stirred into it. Salt and sugar are then added. This mixture is left for a while in order that it may become light. Of course, it is the yeast that makes the dough light. After the dough has risen it is again kneaded (mixed) and allowed to rise again. After it has been kneaded again it is formed into loaves and placed in pans.

The pans are usually greased before the dough is placed in them so that the dough will not stick. It is then left to rise in the pans for a short time. Usually it is found more satisfactory to grease the tops of the loaves. This keeps the crust from cracking while the bread is baking. Next, the pans containing the dough are put into a hot oven. If the loaves are not very large they will bake in about one-half hour.

EXPERIMENTING WITH YEAST—BREAD-MAKING

Here is an interesting experiment for you to make with a yeast cake. First, soak one-half of a yeast cake in some warm water. Then make what is known as a sponge, by mixing enough flour with about ¼ cup of warm water to give you a pasty mixture known as a pour batter. Next, stir in the yeast, cover it, and place it in a warm room.

In about an hour bubbles will begin to appear. As you would expect, these are caused by the gas which the growing yeast plant gives off. Save out a small amount of this so-called sponge. With the remainder of the sponge make a dough by adding 2 cups of warm water, 1 teaspoon of salt, 1 tablespoon of shortening, and flour enough to make the dough stiff. You will be interested in noting the size of the ball of dough at this time for later comparison. Now cover it and allow it to stand in a warm place for about an hour, after which note its size. When it has about doubled in size you should mix, or knead, it down and listen to the crackling noise which follows. What do you suppose causes this noise?

The explanation is quite simple. You will have discovered that the kneading has distributed the gas quite evenly, which does away with the large gas spaces. As soon as the loaves have risen enough to increase their size about one-half, they should be baked in the oven. This baking process usually requires about 50 minutes. Now place a part of the dough which you reserved where it will become frozen. After it is frozen, thaw it out and put it in a warm place to see if it will rise if given time enough. Some of the remainder should next be placed in a very hot place. After leaving it for about 15 minutes, it should be placed in a cold room to see if it will grow. You might leave some in the very hot place for 5 minutes, and some about 30 minutes, to see if either will grow. As a result, you will find out that the bread which has been chilled is not spoiled and need not be thrown away, as the yeast plant is not dead, but merely retarded. While it is found that freezing *does not* kill the yeast plant, it is also discovered that a temperature of much over 98° *does* kill it.

EXPERIMENT TO FIND WHAT FLOUR CONTAINS

Do you know just what the flour which mother uses contains? If you wish to find out for yourself, first mix about ½ cup of flour into a very stiff dough by adding a small amount of water. Next, knead this for several minutes in a fine strainer set in a bowl of water.

It will be somewhat of a surprise to find the mass left in the strainer to be a small gray ball, which can be stretched very much as rubber or gum. Then heat it in the oven, and when it is taken out, note its odor. This substance is called *gluten.*

HOW TO MAKE INVISIBLE INK

DURING the first Afghan War an officer in India received a paper on which was written only the word "Iodine." He put some tincture of iodine over the surface of the paper, and immediately an important message appeared upon it. The words of the concealed message had been written in rice-water, which made no visible marks; but when the paper came into contact with iodine the lettering stood out plain.

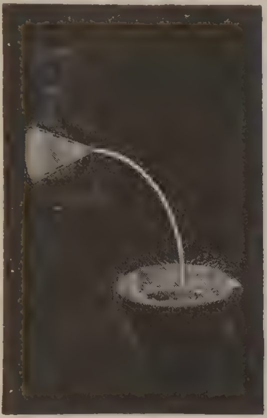
A method of secret writing which has been used by the friends of prisoners who write to them is ingenious and simple. A prisoner's friend may address to his unfortunate comrade a letter of a simple, ordinary nature, which is sure to pass the eye of the warden. The prisoner receives the letter in due course, and rubs a dirty finger between the lines of the visible writing, and new lines appear. The secret is simple. His friend has written between the lines a second letter in milk, and the passing of the dirty finger over the milk lines makes them visible. Sometimes one may want to write a letter that would be visible to the recipient, but would become invisible in a short time. An ink for this purpose may be made by taking 10 grains of arrowroot and boiling it in 1 gill of water, and then, when cold, adding 25 drops of tincture of iodine. The writing made with this ink is visible when written, but it becomes fainter and disappears in about 4 days.

Some inks, invisible when used, become visible by heating. If 1 drachm of chlorid of cobalt and 1 drachm of gum arabic be dissolved in 1 ounce of water, the result is an ink which is invisible, but which becomes blue as the paper is heated, and again disappears when the paper becomes cold. It may be made to appear and disappear again as often as the paper is heated and allowed to cool. A green ink with the same properties is made by dissolving 10 grains of chlorid of nickel and 10 grains of chlorid of cobalt in 1 ounce of water.

A FAIRY-FOUNTAIN EXPERIMENT

THERE is an interesting experiment which any boy or girl can try. It requires little in the way of apparatus and gives a beautiful effect to the eye.

First take a good-sized water-bottle of clear glass, such as is used for bedrooms, and carefully cut in the middle of the body of the bottle a round hole a quarter of an inch in diameter.


The stream of light.

Now prepare a room for the experiment by covering the window with a black blind in which is cut a round hole 4½ inches in diameter. Through this hole the light can come, and the bottle is so placed that the sun's rays can pass through the bottle and out at the small hole, shining in a bright spot on the opposite wall of the room. Having placed the bottle in position, blacken with soot all the rest of the bottle through which the rays are not to pass.

Next place on the floor any large pail to catch the water pouring from the hole in the bottle. Now all is ready for the fairy fountain. The room, of course, is dark except for the light passing through the bottle and shining on the opposite wall.

Placing one finger tightly over the small hole in the bottle, pour, from a jug which has been prepared, clean water into the bottle, filling it up to the neck. Now remove your finger, and a most extraordinary sight meets your gaze. The water pours from the hole in the bottle into the pail in a curve, but it looks, not like water, but like liquid light or fire, and the pail, too, seems to be filling with fire. At the same time the beam of light through the hole to the opposite wall has disappeared.

You will be fascinated as the water gets lower and lower in the bottle. Then suddenly the glorious curve of light is gone, and the beam shines once more straight upon the opposite wall, as it did before. The fairy liquid gold has disappeared.

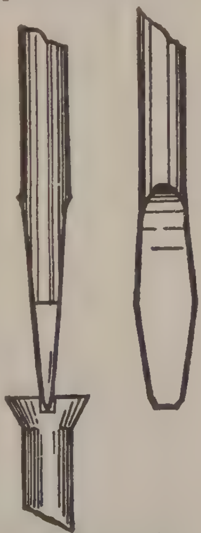
What is the explanation of this amazing fact? It is simply that the light is imprisoned in the stream of water, and light and water flow out together in the same direction. The water acts as a kind of tube in which the rays of light that pass through the bottle are reflected from side to side of the tube of water without being able to escape, and so are carried into the pail, where the illumined water appears like liquid fire.

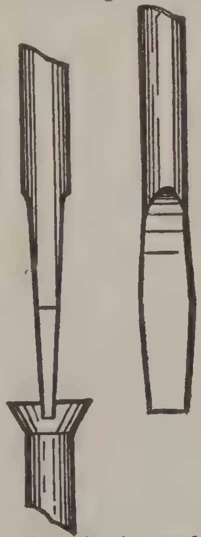
If you hold something in the way of the stream of water, so as to break the stream, the splashing water will look like sparks of fire. Still more beautiful effects may be obtained by placing between the bottle and the hole in the blind, as the water runs out, pieces of colored glass, red, blue, green and yellow, one after the other.

To make the flow of water from the bottle more permanent, you may connect the bottle with a tap by means of a piece of hose, or if that is not possible, place a pail of water above the bottle, and connect this with the bottle by means of a piece of piping, or rubber tubing, forming a siphon. The effect is more startling the longer the golden liquid flows.

HOW TO RENEW THE EDGE OF YOUR SCREWDRIVER

WHEN the point or edge of a screwdriver is worn away, so that it jumps the nick in a screw, it is time that you sharpened it again. This difficulty is caused by a section of your screwdriver which has the sides of the wedge worn so that they curve with the convex sides outward, as shown in picture 1. When the screwdriver is in this condition it is certain to slip out of the nick in the screw. The best form is that shown in picture 2, where the sides of the wedge are straight or even curve with the concave side outward. With this kind of end the screwdriver may be easily kept in the nick without slipping. To grind a screwdriver into this form it is necessary to use a very small grindstone.


1. Worn screwdriver with blunt edge.


2. Properly sharpened screwdriver.

Another way to sharpen a screwdriver is by filing, holding it in a vise with the bevel of the point lying in a horizontal position and projecting above the surface of the vise jaws. By using a medium flat file you may give a forward thrust and keep a horizontal position throughout. Now turn the screwdriver over and repeat the operation until the edge becomes somewhat thin. Then file it down to a perfectly straight margin and regulate its width for the size required. This method is sometimes found more satisfactory than that of truing up the point on a grindstone.

A screwdriver point should be neither too hard nor too soft for general use. A satisfactory test is to use a file on the end. If the file refuses to take hold you will know that it is too hard, while if it can be filed easily you may be certain that it is too soft. In either case it should be re-tempered.

The surest way to ruin a good screwdriver is to use it as a can-opener. But many people do this and yet wonder what is the matter with the tool.

SUGGESTIONS FOR YOUNG MECHANICS

THE practical suggestions which are given on this and later pages are intended to aid you in taking better care of your tools and in doing your work more easily and quickly. In buying tools keep in mind that a good quality of tools is usually considered less expensive in the long run than is the cheaper quality of tools. Also remember that your tools must be well cared for if the best results are to be had. You cannot do your best work if your tools are dull, broken or rusty.

How to Remove and Prevent Rust. The following method has been found highly satisfactory for removing any rust from the iron and steel surfaces of your tools: First cover the metal with sweet oil, rub it well, and allow it to stand for over a day. Then cover it with another coat of oil which should be applied freely with a piece of cotton-wool or cloth after the steel has been rubbed. Next rub with unslaked lime which has first been reduced to as fine a powder as possible. If the rust has not been entirely removed, this process should be repeated.

The following methods are recommended for preventing rust on the metal surfaces of your tools. Several recipes are given in order that you may choose any one for which you have the necessary ingredients.

One method of keeping tools from rusting is to take ½ ounce of camphor and dissolve it in 1 pound of melted lard. Then take off the scum and mix in as much fine black lead (graphite) as is needed to give it an iron color. Now clean the tools and cover with this mixture. After about a day rub the surface clean with a soft linen cloth. The tools should remain clean for months under ordinary use.

Another good method is to melt 2 ounces of tallow, or 6 ounces of lard, and 1 ounce of resin together. These should be strained while hot to remove the specks which are in the resin. Then apply a thin coat of the mixture on the tools with a brush. This should keep off the rust for a long time.

A satisfactory method is to place 1 quart of freshly slaked lime, ½ pound of washing soda, and ½ pound of soft soap in a bath with sufficient water to cover the articles. Then put in the tools as soon as possible after they have been used. Either wipe them dry on the next morning, or allow them to remain until they are used again.

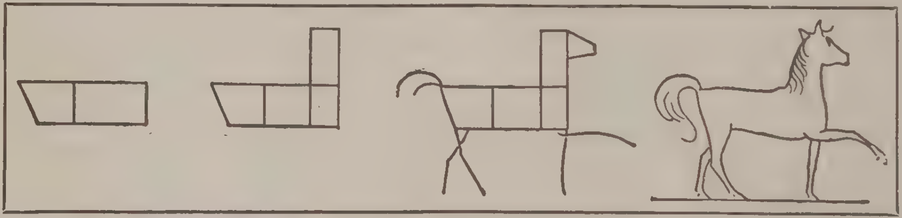
Still another method is to slake a piece of quicklime with just enough water to cause it to crumble in a covered dish. While hot add a little tallow to it and work into paste. Use this to cover over bright work. It may be easily wiped off when desired.

How to Mark Your Metal Tools. First, use either sandpaper or whetstone to clean off all rust, gum and dirt from the place where the letters are to be made. Then cover the metal with a thin coat of beeswax or tallow. Next, take a pencil or any sharp-pointed instrument and mark the letters through the wax, being careful to remove all of the wax from the bottom of the letters. Now make an etching fluid from equal parts of common salt, bluestone and water, and dip your pencil in the fluid to fill all the letters in the wax.

By the time you have finished your work the acid in the first letters will have done its work, so you may clean your tool to see what kind of job you have done. The acid should have etched out the letters in a clear-cut manner.

A SIMPLE WAY OF DRAWING A SPIRITED HORSE

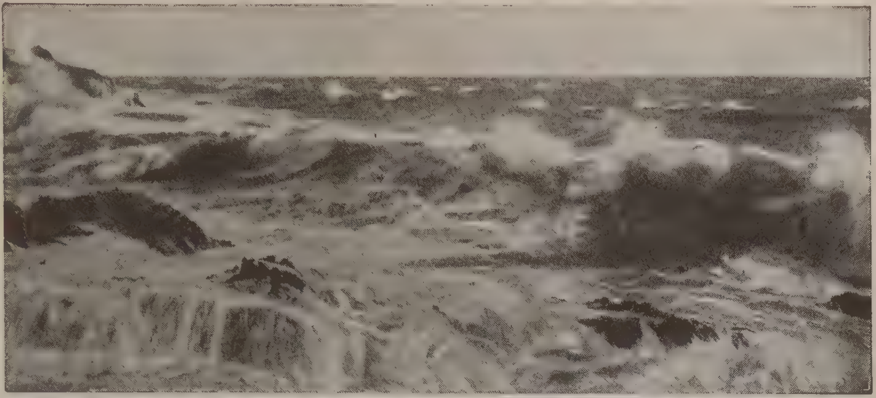
HERE is an example of the way in which we can draw a spirited horse with ease. On page 753 of this book we read of the way in which we can draw other pictures of this kind. We begin by drawing the figure on the left, then we carefully add the other necessary lines and rub out with an eraser all the lines that cut through the body, and our horse is complete.



HOW TO SLEEP

WE should all know how to sleep, for there are several rules which often make all the difference to the value of sleep, or to our getting any sleep at all. For instance, it is not good to sleep on the back. There are many reasons for this, but all we need know is that sleep on the back is more liable to be disturbed in various ways, including nightmare, than sleep on the side. The heart comes nearest the surface on the left side of the body, and also the stomach is mostly on that side, so most people find that they sleep best on the right side, and many people cannot sleep at all on the left side. Another good rule for practically everybody is to go to bed to sleep, not to think or to read, and to get up in the morning when called. Always have plenty of ventilation in your bedroom. Open all the windows wide, and get all the outdoor air that you can even when sleeping. Have enough covering on your bed so that you will not take cold. Go to bed each night with pleasant thoughts on your mind, sleep in a room with plenty of good fresh air, and you will surely feel bright and rested when you awake next morning.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 747.



The waves of the ocean that have played their part in the shaping of the earth.

HOW SUN AND WIND MADE THE HILLS

CONTINUED FROM 527

MOST of the wonderful things that happen in the world depend on things working together, and nothing is more interesting than to discover and study the working of the great and little partnerships which often appear in nature.

Probably the most powerful and most important partnership ever formed was the partnership between sun and wind to make mud. Both are mighty workers, never idling and never resting: they have factories all over the world, and their production is, and has been, stupendous beyond imagining.

Sometime after the earth had been formed its surface was merely a veneer of slag some thirty or forty or fifty miles thick, and it probably would have remained simply a crumpled crust of gray and green and black slag, covered here and there with water, if the sun and the wind had not started to make mud-pies.

The sun toiled ceaselessly to lift water to tremendous heights in the sky, where it formed clouds, and the wind carried the clouds about, and made them fall in rain, mostly on the top of hills; the rain collected into streams and rivers; and the streams and rivers broke up the basalt and granite into mud, until the whole earth was nothing but a big mud-pie.

The moon seems to do pretty hard work when it lifts the tides, and some pumping machines can raise many tons of water a day; but such work is child's play compared with the work done by the sun. The clouds seem light, but they contain enormous quantities of water, and the total weight of water raised by the sun during the year must be millions of millions of tons, for it is enough to keep the Amazon and the Nile and the Mississippi going, not to speak of Niagara and the Victoria Falls, and a thousand other rivers. It is calculated that the rain which falls yearly upon England and Wales alone weighs nearly 70,000 million tons, and every drop of it is lifted by the sun!

Indeed, the work the rivers do is really the work that has been done by the sun and the wind; all the rivers themselves do is to let themselves fall into the sea.

Yet, as they fall, they wear away the hard rocks of their beds, and ages ago they wore down into mud all the granite and basalt surface of our planet.

The wind, of course, does a great deal to assist the sun in the mud-making. It lifts the clouds higher and carries them about, and, with the help of the moon, it hurls the waves on the coasts of the world and gradually breaks them down. Also it blows about sand, and wears down rocks as with a sand blast. The carbon dioxid is also of assistance. It is dissolved in the rain-water, and acts chemically on lime and marble and other materials in the crust. Frost and ice, too, are rock-grinders, rock-breakers and mud-makers. But the sun is the best worker in the great mud firm, and most of the mud in the world is due to his strong arm. If we look at the rivers nowadays we get some idea of what they, with the sunlift in them, are able to do to turn the dry land into mud.

ENOUGH SALT IN THE SEA TO BURY ALL THE DRY LAND

Consider the salt in the sea, practically all of which they collected! How much salt is there in the sea? It is estimated that the sea contains billions of tons of it—enough to cover the whole dry land four hundred feet deep; that is to say, to cover the earth with salt higher than all except the tallest buildings. That is surprising, but more surprising still are the estimates of the mud carried yearly into the sea by great rivers. The Mississippi carries more than four hundred million tons of sediment yearly into the sea; while the Yellow River of China brings down every year perhaps twice as much. Altogether the rivers of the world are supposed to bring down about forty times as much as the Mississippi alone—enough to make a great mountain of mud. Egypt is made of Nile mud, and the Netherlands chiefly of mud of the Rhine.

That is how the world has been sculptured and planed. The peak of the Matterhorn, the great limestone masses of the Dolomites, the vast cañons in Colorado, the great sierras of the Andes, were all shaped by the wet fingers of the sun.

THE GREAT MOUNTAINS THAT ARE WASHED INTO THE SEA

But this mud-making has been going on for years upon years, and even the yearly mud-pie of the Yellow River is merely a drop in the bucket compared with the mud of the past. All over the world we see not only mountains worn half away, but signs that mountains have been worn down to their very base—not only the crumpled granite ranges of the early crust, but great volcanoes that pierced through the early mud. We find—more astonishing still—that the mud of destroyed mountains has risen again as rocky mountains from the bottom of deep seas, and has again been worn down. We find that this has happened many times in succession, until now the earth is covered miles deep in mud and mud rock, and the only bits of its surface that are not mud or mud rock are the volcanoes and the granite and basalt lavas that have forced their way through the mud; or else such rocks which show where the mud rock has been worn away.

All the great mountains of the world, except the volcanoes, are composed of sea-mud rock, and a great part of them—as the Alps, the Himalayas and the Apennines—are built of lime mud previously built into seashells. Rocks made out of mud deposited in the sea are usually known as *aqueous* rocks (from the Latin word *aqua*, meaning "water"), because they have been formed in water; or as *stratified* rocks (from the Latin word *strata*, meaning "layers"), because they have been laid down in layers on the sea bottom.

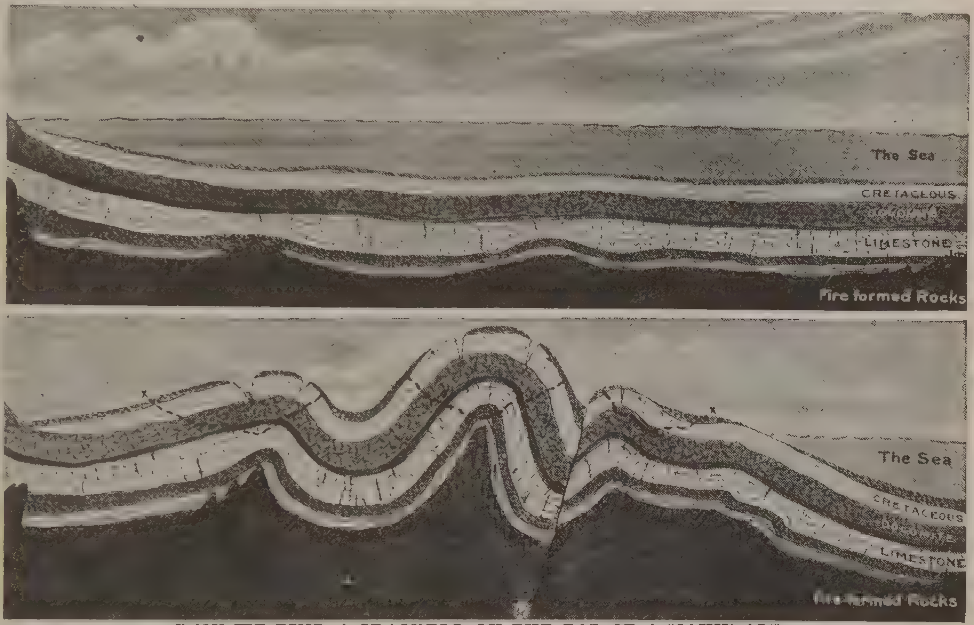
THE ROCKY DEEPS IN WHICH IS WRITTEN THE HISTORY OF THE EARTH

They were all originally part of the crust—either as slag actually in the crust, or as slag-lava driven through the earliest coatings of mud. Limestone and chalk and clay and sandstone are all examples of aqueous or stratified rock. The rocks such as are seen in granite and basalt and other lavas are called *igneous* rocks (from the Latin word *ignis*, meaning "fire"), because they were forged by fire, and are not directly made from mud. There are rocks which seem to be between the two kinds. They are called *metamorphic* (from Greek words meaning "changing form"). They are rocks which have been changed by moisture, heat and pressure, or by one or two of them.

The making of mud from igneous rocks, and the destruction and reconstruction of mud rocks, has been going on for untold ages. The examples we have given to show how quickly rivers make mud show that in millions of years huge quantities of rock must have been made and remade. How deep would all the layers reach if they had not been destroyed but had been piled on each other!

Calculations, of course, are only very rough, but it has been calculated that from first to last they would reach at least thirty or forty miles high, and some authorities say at least double that height. Professor Sollas thinks that even since the first backboned animals appeared in the world, mud thirty-four miles deep has been deposited. It is quite plain that if the floor of the sea had not time after time risen into continents and mountains, there would be no land above water to-day.

Of mud all life was made; on rock made of ancient sea-mud and filled with ancient seashells most men and plants now live; and without mud there would be no world as we know it. But the layers of the mud are also the illustrated history of the earth, as we shall soon see.



WHY WE FIND A SEASHELL ON THE TOP OF A MOUNTAIN

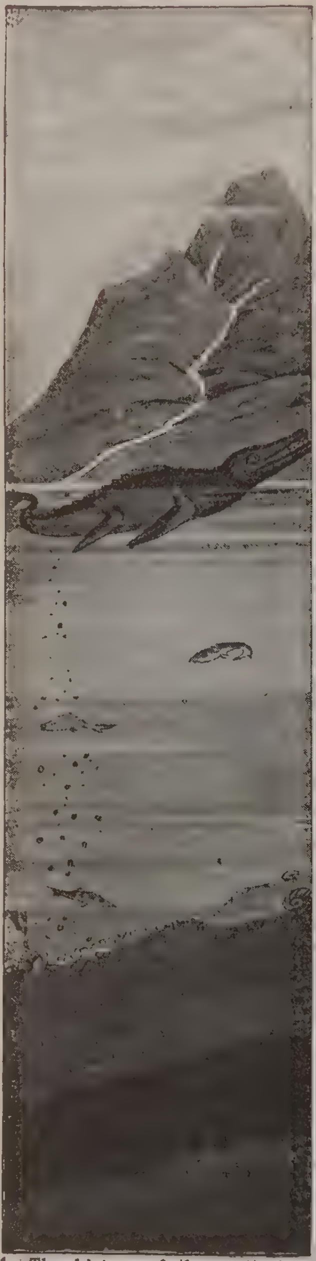
These two pictures explain how the mountains arose from the bed of the sea. The top strip shows layers of sedimentary rocks beneath the sea, and the bottom picture shows the gigantic folding of the rocks which has for some reason taken place. Since this happened sun, rain, wind and frost have worn away the parts indicated by the dotted line.

When men began to study the *aqueous* rocks they found in them the remains of animals and plants; and geologists soon discovered that the remains found in the deepest layers of mud were very different from the remains we find in the layers nearer the surface.

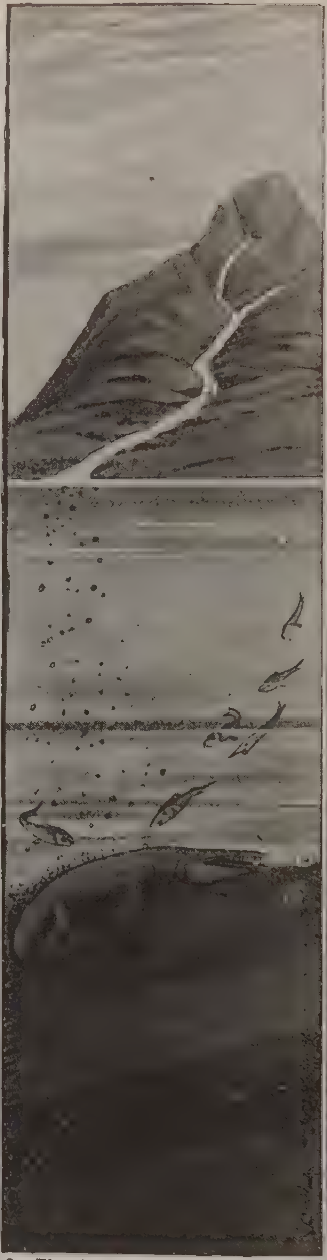
By comparing the position and contents of such layers it is found that they could be arranged in chapters and leaves like the chapters and leaves of a history book, and that we could read the history of the world in this history book for millions of years. We know by the amount of mud laid down above a certain layer that it tells the history of the earth millions of years ago when the mud was made, and we can say that in these early days Illinois—or New Zealand, as the case might be—was under water and the sea was full of sharks or seaweeds; or that in these days the Arctic region had a tropical climate, with ferns and mosses growing to a great height, or that in other days the earliest horse appeared; or at another time there were huge reptiles. By comparing the contents of layers with their position, and their position with their contents, it is possible to put the layers of mud rock with their fossils—as the remains are called—in their correct position.

It does not follow that because a layer is now on the top, therefore it is newly laid down. It may be on the top because the other layers have been worn off it. But geologists, by a process of comparison, got over that and other difficulties, and now, in the strata of the earth, we can read the story of some of the changes in its crust and of the changing life which has filled the earth—of the lifting of Mount Everest from the sea, the blossoming of the first flowers, and the coming of the first birds, and the history of mankind. This is a long, long story; its pages are at least thirty or

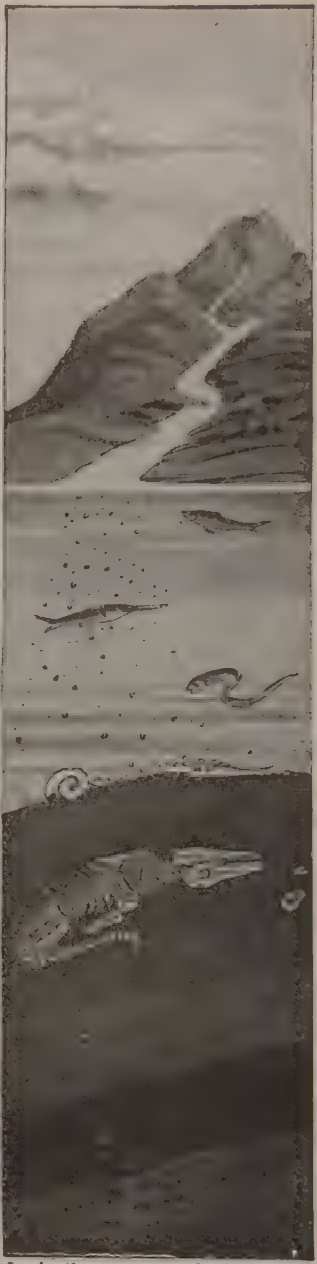
THE CHANGING EARTH FROM AGE TO AGE



1. The history of the earth for millions of years is written in its rocks, and men are able, by reading the rocks, to give us a vivid panorama of the earth's long story. We can see also how that story came to be written in the rocks. A million years ago a little stream trickled down a mountain, carrying sand and stones to the sea. In the sea swam the ichthyosaurus.

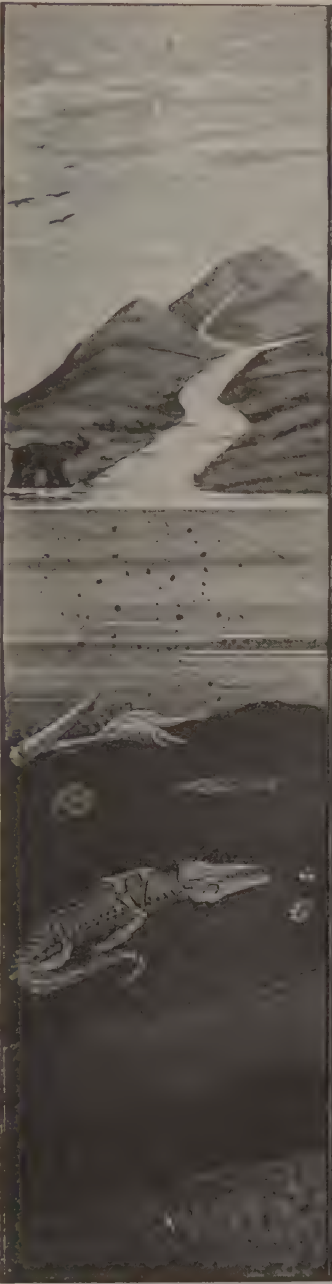


2. The ichthyosaurus was a reptile living in the sea, and its name means fish-lizard. It had a great head with powerful jaws and teeth, and its body had four limbs like paddles which enabled it to swim. One day this great creature died, and its body fell to the bottom of the sea. Meanwhile, the stones and sand brought down by the stream continued to fall.

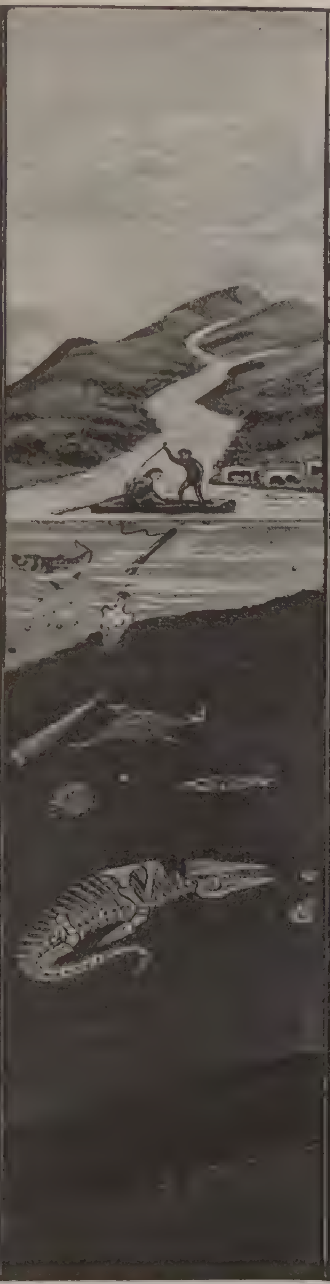


3. As the ages passed, the stream wore away a wider and deeper bed for itself and became a river; and the rains falling on the mountain loosened the soil and formed hundreds of tiny streams, each running into the river. As the river became wider it brought down more earth and stones, which fell in a never ceasing shower on the bed of the sea, and buried the reptile's body.

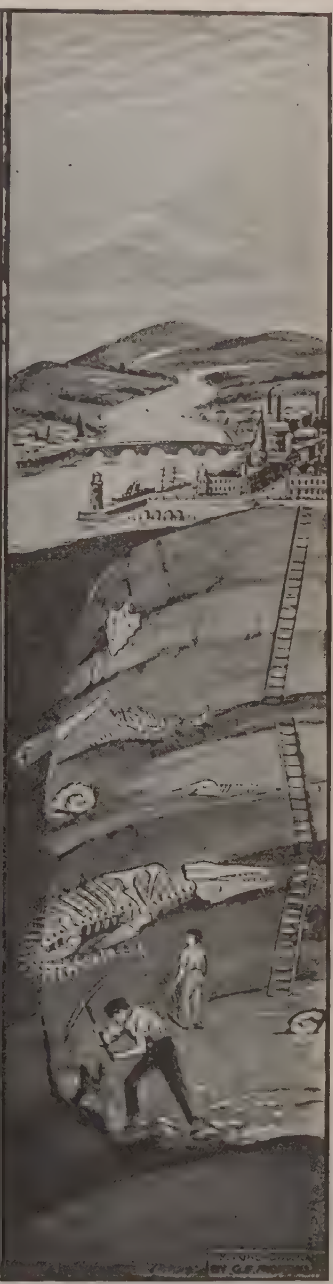
THE WONDER-STORY TOLD IN THE ROCKS



4. Higher and higher rose the ocean bed as the mud from the mountain continued to fall, and the lower layers became hard rock. One day an elephant going to the river to drink broke off his tusk, and this was carried to the sea. Another day a bird was drowned, and fell on the ocean-bed. Dead fishes and shells also sank, and all were buried.



5. And then at last, hundreds of thousands of years after the ichthyosaurus died, men began to live on the earth. One day a man who had made a boat out of a hollow tree-trunk took his wife and went out to fish, and the head of his harpoon broke off and fell to the bottom of the sea, and this also was buried in the mud.



6. The bottom of the sea crept higher and higher, till at last it became dry land. Then one day men began to dig, and the world's wonderful story was revealed as we read it here. First the spear-head was found, then the tusk, the bird's skeleton, the shells, the fish, and at last the skeleton of the great reptile, all turned to stone.

forty miles thick; and all we have time to do here is to skim over some of the chapters. But the torn and fragmentary pages—some early, some recent—which lie open to our gaze, are specially explained and illustrated in these pages by our scientific artist, who, like a wizard, can call up animals and plants long dead.

THE CHIEF CHAPTERS OF THE LONG STORY-BOOK OF HISTORY

Skimming, then, through the wonder story told on nature's tables of stone, we find that there are four chief chapters of the world's history since life appeared.

1. The chapter of very ancient life which we call Palæozoic, from the two Greek words meaning "ancient" and "life." This is divided into periods which we call Cambrian, Ordovician, Silurian, Devonian, Carboniferous. In America sometimes the Carboniferous is divided into three, called Lower and Upper Carboniferous and Permian.

2. The chapter of ancient life which we call the Mesozoic, from the two Greek words meaning "middle" and "life." This is the Second Era, with periods which we call Triassic, Jurassic and Cretaceous.

3. The chapter of more recent life, which we call the Cenozoic, from the two Greek words for "new" and "life." The first division is the Tertiary—the Third—and its chief periods are the Eocene, Miocene, and Pliocene.

4. The chapter of life embracing the time of human history in which we live, called the Quaternary, or Fourth. It includes what we call the Pleistocene Period, named after the Greek words for "newest" and "life," and the Recent.

THE FORMS OF LIFE FOUND IN THE EARLIEST ROCKS

Much the longest of these chapters is the first, containing the oldest certain remains of living things. There are hints of life in still deeper layers of the earth's crust, and probably life in its simplest forms began long before the Palæozoic rocks were made; but the deepest pages of the stony history of life have been so crushed and heated that their story has been obliterated, and our history begins with the Palæozoic Era. It is, of course, intensely interesting to find out what plants and animals existed then.

Bits of this ancient chapter are found all over the world. In various parts of North America some of the pages of this book may be found, especially in the neighborhood of the Great Lakes. Rocks of this era are abundant in Wales, and the first sub-chapter, the Cambrian, takes its name from the Latin name for Wales—Cambria.

But wherever the pages or fragments of pages occur, we find only rather primitive life—seaweeds and corals, crab-like creatures and sponges; and toward the end, fishes and insects and scorpions. As there were insects and scorpions, there was, of course, vegetation, and toward the end of the chapter we find great fern trees and giant mosses. Indeed, most of the coal we use is the decayed remains of the luxuriant vegetation that flourished toward the end of this chapter. The creatures most characteristic of this period were the trilobites—little lobster-like animals in shells, with compound eyes on the tops of their heads. Toward the end of this period amphibians appeared.

THE EIGHTY-FEET LIZARD, AND THE REPTILE WITH LEATHERY WINGS

The Mesozoic Period was rich in life, but especially rich in reptiles. It was indeed, the age of reptiles, and the rocks of this chapter are full of the fossils of strange reptiles now extinct. In the sea swam huge lizards, such as the plesiosaurs and ichthyosaurs, and on land reigned the tremendous dinosaurus, brontosaurus, and diplodocus. Diplodocus was over eighty feet long from the end of his snout to the tip of his tail, and brontosaurus was even larger.

But more interesting and extraordinary than these was the pterodactyl—a creature half reptile and half bird, with leathery wings twenty feet long, and at first with teeth in their jaws. Another reptile called the archæopteryx had feathered wings and a feathered tail; we call this the first bird. In this period, too, even while the plesiosaur and the ichthyosaur swam about in the sea, the little sea-creatures called foraminifera were making the little chalk-shells which we see to-day in the white cliffs of Dover. Now also appeared the first mammals.

The Cenozoic Period is the Age of Mammals, and toward the end of it we find traces of the greatest of all mammals—the mammal Man, whose large brain and skillful hand have made him lord of the earth. This, then, is a brief account of the making of the mud rocks.

THE NEXT STORY OF THE EARTH IS ON PAGE 773.

This picture gives us an idea of the size of the gas-pipes used in the main lines.

WHERE GASLIGHT COMES FROM

CONTINUED FROM 535

As we go about the well lighted streets of our towns and cities in these modern times, it is difficult to realize that a hundred years ago there was practically no such thing as street lighting. Napoleon never used a gas lamp. In his day the houses of the rich were lighted by candles made in molds, or by wax candles for state occasions, while poor people had to content themselves with the light of a tallow dip, or else the firelight. Dim lights were hung here and there on the streets, and if a citizen went abroad on a dark night he carried his lantern with him. Good lights, gas or electric, are to us such familiar things that we can scarcely realize the eagerness with which our grandparents, when they were children, watched for the lamplighter. How it fascinated them to see him put his little ladder against the lamp-post and run up the steps, and how they wondered where he got the lights which shone like stars along the dusky streets!

Where does the gaslight come from? Our first thought, of course, is that it is imprisoned in the gas-pipe like the genii in the bottle. When we turn the key that holds it fast, it rushes out, eager to escape, and the moment we touch it with a flame it burns brightly. Before it reaches the pipe, however, it has to go through a long and troublesome process; and to learn its full story we must turn to another part of the book and read about the coal, from which the gas is made. Before we go any further, let us make an experiment.

Take a long clay pipe. Fill the bowl of it with tiny pieces of nice bright soft coal. Then cover the coal with clay tightly fixed into the top of the bowl. Now ask your father to put the bowl of the pipe into the bright red coals of the fire, leaving the stem of the pipe sticking out toward you. If you watch for a moment or two you will see a thin stream of smoke come out of the stem of the pipe. That is gas, and it has been driven from the coal by the heat of the fire around the pipe. Though of course gas-making is a much more complicated process, this little experiment gives us the principle of the work, and the gas from our pipe will burn.

Remember that for this experiment you must use bituminous, or, as we often call it, soft coal. This coal is used in making coal-gas because it is richer and gives away its gases more easily than anthracite. Anthracite, which is nearly all carbon, is used to make water-gas, but that is another story, and coal-gas comes first.

HOW THE GAS IS DRAWN FROM THE COAL

Now let us pay a visit to the gas-works, where, first of all, we shall see a number of hollow tubes, called retorts, set in groups. In some places the retorts are made of iron, but in this country they are made of fire-brick. In these the gas is made, and our pipe experiment will help us to understand how it is done. In front of the retorts, or at a little distance below them, a large fire is made. When this fire is a glowing mass of heat, air, or air mixed with steam, is forced up through it, and mingling with the gas which comes from the coal, creates a new gas which gives great heat. This hot gas from the fire is carried up through pipes into a closed chamber around the retorts, and is again mixed with air, so that when the oxygen in the air burns, it may supply still more heat. The retorts have been charged with coal, and as the fierce heat beats against their sides the coal is broken up into the parts of which it is made. The solid carbon, which we call coke, is left behind, but all the other parts rise in a heavy vapor-like gas which finds its way out of the retorts just as it did through the stem of your pipe.

HOW THE IMPURITIES ARE REMOVED FROM THE GAS

The pipe through which the gas leaves the retort carries it into a tank of water, which robs it of some things that cool quickly, and these are left behind in the form of ammonia and tar.

It is, however, not pure enough. It still holds many things that are injurious to metal work and hangings, and which we can use in other ways. So, from the tar-extractor, where it loses the greater part of its tar, it goes through washers to the condensers, where it is cooled, the last traces of tar are removed, and the water-vapor which it holds is condensed, or turned back to water. From the condensers it goes through processes called washing and scrubbing, and finally it is forced up through purifiers filled with lime or oxid of iron, which causes it to lose the last of its impurities—a gas which has the long name of sulphureted hydrogen. From the purifiers it passes into the meters, where it is measured, and at last it reaches the gas-holders—the ugly iron tanks which we know so well.

Now let us go back for a moment to see what becomes of all the things that have been taken out of the heavy vapor to leave it the colorless gas that burns so brightly. All these things are useful, and none should be wasted. Tar, as we have seen, comes from it, and ammonia. From the tar are made the colors with which your dress or suit is dyed. Benzine and carbolic acid are made from these by-products, and so are alum, many of the medicines that we get from the druggist, and a hundred things that are useful in many ways to the chemist.

If coal-gas had never been made, we might have had no big guns, for the picric acid which helps to make the high explosives in these guns is obtained from carbolic acid. Delicious perfumes, which we can scarcely distinguish from the perfumes made from flowers, also come from what is left over when gas is made; saccharine, which is at least three hundred times as sweet as sugar, is also made from it; paint is another product. It is as if the forests that covered the earth when no man had set his foot on it, had stored up all the good things they had gathered from the light and air so that we might enjoy them in these later days.

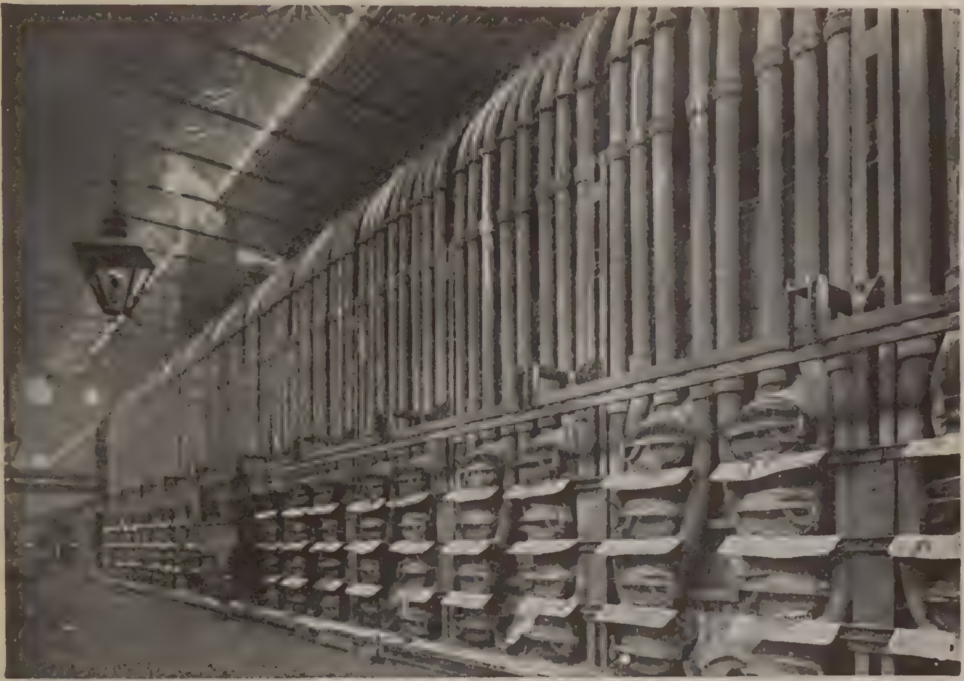
Benzene, or benzol, is the part of the gas which gives it its highest illuminating power. Some of it is carried off with the tar, but the greater part remains in the gas to give light when it is burned. Recently, however, as much as possible of this valuable product has been removed in some places. The benzol has been needed to produce toluol, which is used in high explosives for big-gun ammunition.

The removal of benzol does not reduce the heating powers of gas. It would, however, make the gas very poor for lighting purposes if it were not for the Welsbach lights, or gas mantles, which are now generally used in gas lamps. When we use them, our rooms are illuminated, not by the light of the gas, but by the incandescence given to the mantle by the burning of gas within it.

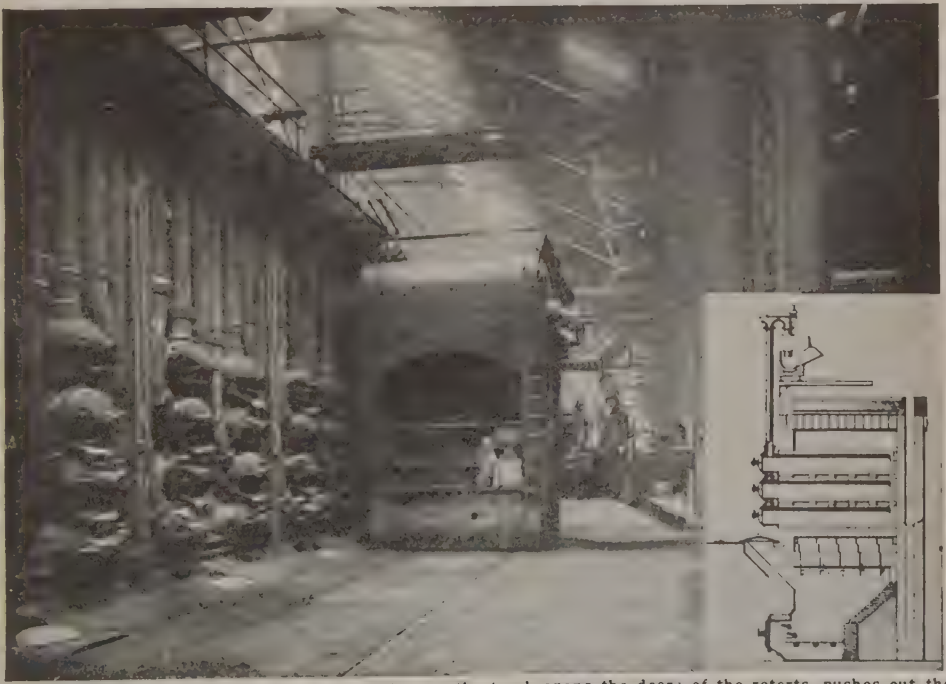
HOW WATER-GAS DIFFERS FROM COAL-GAS

A great deal of the gas which is used in this country is what is called water-gas, or, to give it its full name, carbureted water-gas, and is made in a quite different way from coal-gas. Very often both kinds of gas are made by one company, and the two are combined for use in lighting and heating our houses.

HOW THE COAL IS COOKED



Here is one of the great retort-houses, where the coal is placed in air-tight retorts, or ovens, and heated in a temperature of 1325 Centigrade. The gas is driven off to be purified and cleaned for use in our homes.



Here the retorts are being fed. The machine on the truck opens the doors of the retorts, pushes out the baked coal, called coke, and fills the retorts with fresh coal. The fire which bakes the coal is fed through the white doors on the ground. The small picture shows an end view of a bench of retorts cut through the middle. Underneath is the fire-box, from which the heat flows around the retorts.

In the making of water-gas, steel brick-lined chambers, called generators, are used instead of retorts, and the coal is not distilled. The generator is filled with fuel, usually coke or anthracite coal, to a depth of about seven feet. This fuel is set on fire, and air is forced up through it until the whole mass has reached a glowing, or incandescent, heat. When it has reached this stage, the air is shut off, and very hot, dry steam is forced through the fire. As the steam comes in contact with the hot carbon it is decomposed; that is, the hydrogen and oxygen fly apart, or dissociate from each other. The hydrogen is set free, the oxygen in the steam joins itself to the carbon to form carbon monoxid, and a new gas, called water-gas, is formed by the carbon monoxid and hydrogen. The process of forcing air through the hot coal to create more heat is called a "blow"; forcing steam through the fire to make the gas is called a "run"; and run and blow follow each other regularly as long as the process of gas-making is going on.

HOW WATER-GAS IS MADE RICHER

The water-gas which is thus made, will burn with a blue flame, from which it receives the name "blue gas," but to enable it to give light it must be enriched by having more carbon added to it, and this is the next step in the process.

From the generator the gas is carried into another steel chamber, called a carbureter, which is not only brick-lined, but is filled with bricks which are built up in an open checkerwork, and these bricks are heated by the gas during the blow until they are white hot. As the gas is led into the carbureter, oil is sprayed from the top down through the bricks, the heat of which turns the oil into gas. This gas, which is very rich in carbon, combines with the water-gas which is now pouring into the chamber, and the union of the two produces a mixture which is very much like coal-gas and possesses higher illuminating qualities.

From the carbureter the gas is carried into still another chamber, which is called a superheater, and here it is brought to a yet higher temperature in order to "fix" the mixture, that is, to make the gas permanent. It is then washed, scrubbed and cooled; the tar which is got from the oil-vapor is taken out, and it finally goes through very much the same process of purifying as the coal-gas we have already described.

In the making of coal-gas, the gas flows from the retort without stop. The making of water-gas, however, is intermittent. In other words, there is a pause in the run of gas while the heat of the fire is being raised by the blow. Consequently water-gas requires two holders. A little more than midway in the process of purifying, it is collected in what is called a relief holder. From thence it can be sent in a continuous flow through the rest of the process into the storage holders, or tanks.

HOW GAS IS CARRIED TO OUR HOUSES

If you look at these tanks you will see that they are supported in a framework. Really they are inverted tanks suspended over a quite deep well of water. The gas is lighter than air, and when it rushes into the gas-holder it forces its way up. The gas-holder, though it looks heavy, is so nicely balanced that it rises with the gas until it is full. As the gas leaves the gas-holder to come to our houses, the gas-holder sinks slowly down again into the water. The gas-holder is always pressing down upon the gas, and this forces it into the pipes.

These pipes are made of iron and are placed deep down in the ground. They are very strong and carefully fitted end to end, or else the gas would leak out and be wasted. Wherever there are gas lamps we may know that somewhere underneath the streets big gas-pipes have been laid. When the pipe reaches the house, smaller pipes must be laid, so that they reach all the rooms. They are laid under the floors or inside the walls, and come out through openings made in the walls or ceilings. Short lengths of brass pipe are attached, pretty fixtures are screwed on; then all we have to do is to turn the key and light the gas, and the darkest room becomes bright. The same gas will heat the oven in which your dinner is cooked. It will drive an engine, just as steam does. It will warm the greenhouse and keep the plants snug and cozy in the winter. It will make the water warm for your bath, and will burn brightly all night in street lamps. Perhaps some day we shall use electricity for cooking as well as lighting, but so far gas is much cheaper.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 761.

WHERE THE GASLIGHT COMES FROM

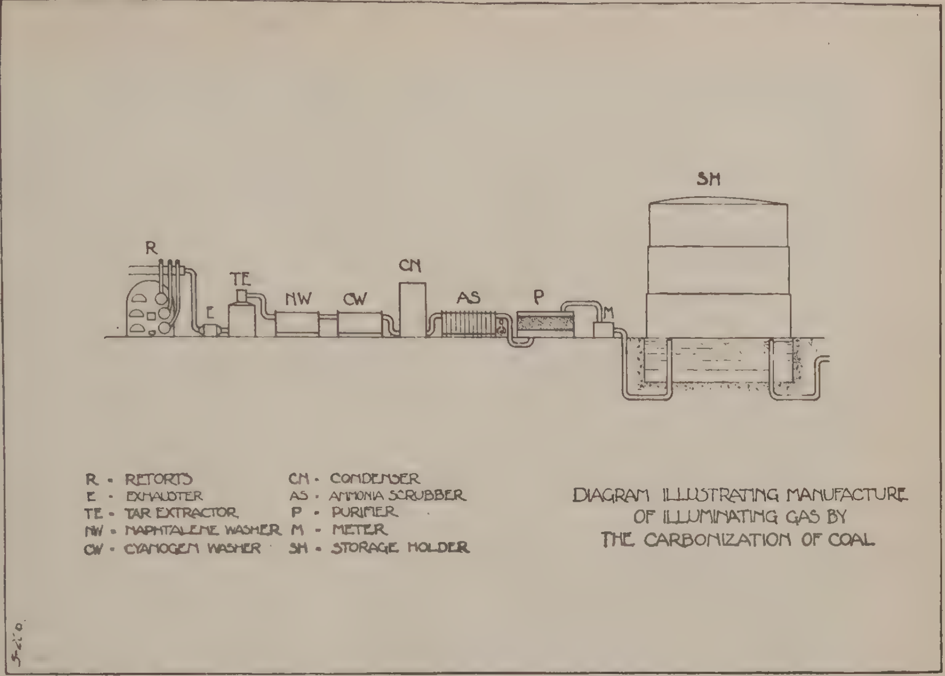


DIAGRAM ILLUSTRATING MANUFACTURE OF ILLUMINATING GAS BY THE CARBONIZATION OF COAL

You see here a diagram in miniature of one of our large gas-making works. First come the retorts from which the gas is drawn by the pump in the exhauster. Then comes the tank in which the tar is taken out, and after that we are shown the process of washing out the impurities before it is brought into the condenser to have the water-vapor removed. Then it goes through more scrubbing and purifying.

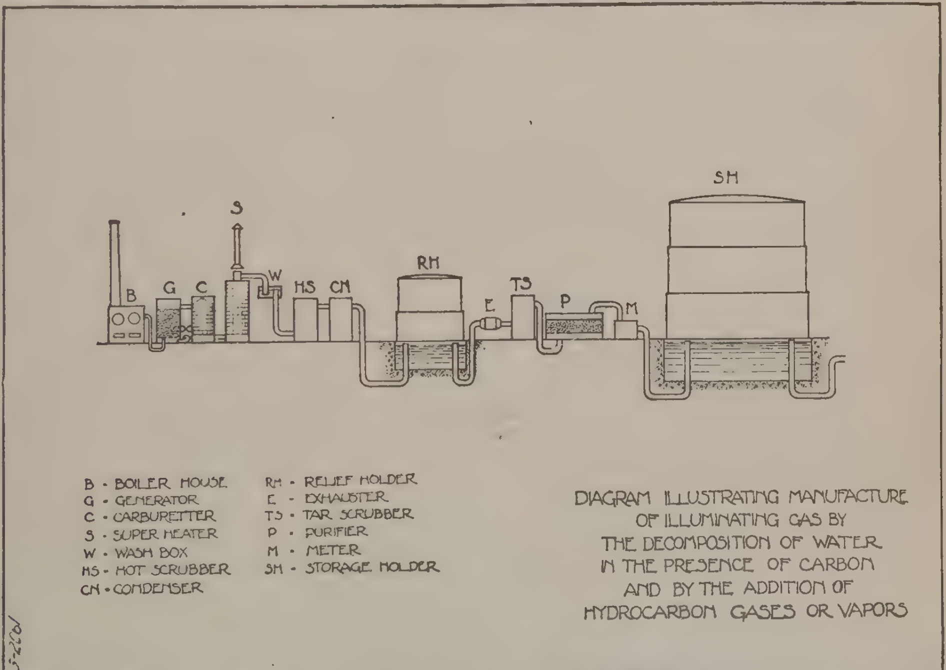
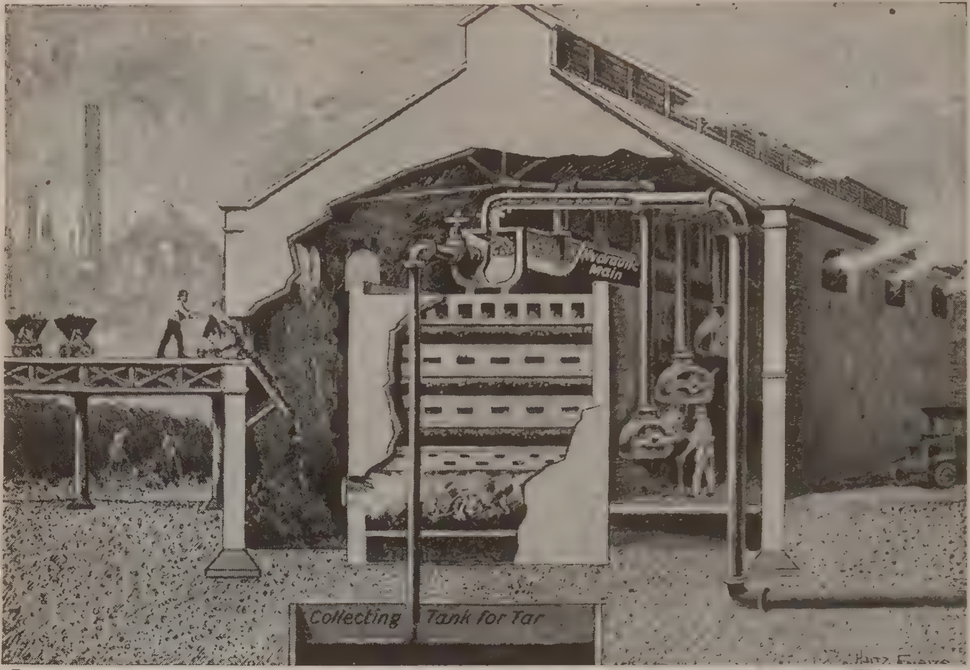


DIAGRAM ILLUSTRATING MANUFACTURE OF ILLUMINATING GAS BY THE DECOMPOSITION OF WATER IN THE PRESENCE OF CARBON AND BY THE ADDITION OF HYDROCARBON GASES OR VAPORS

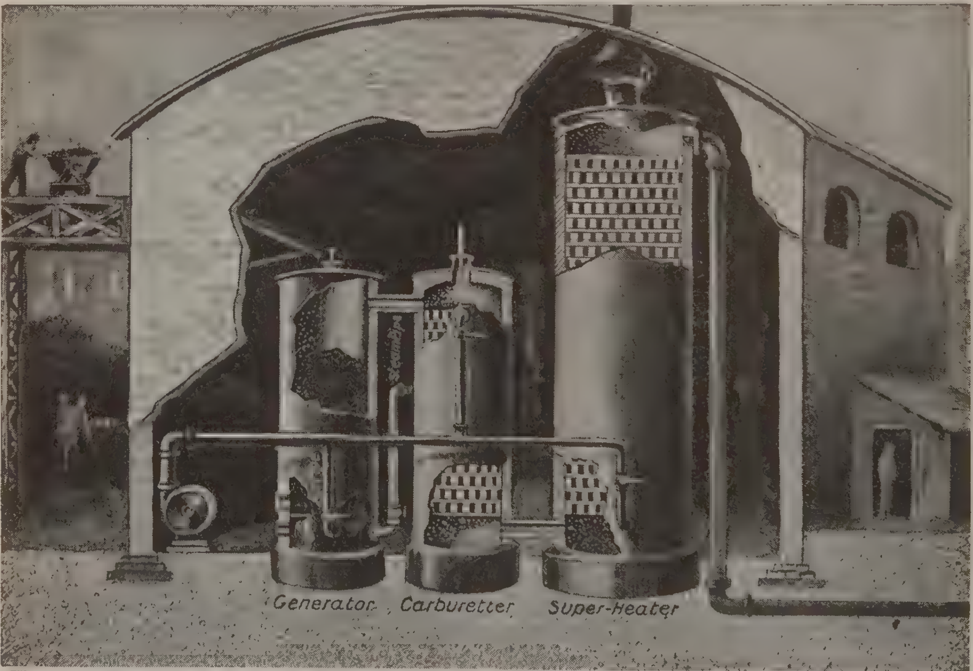
The diagram above tells us briefly the story of coal-gas. This diagram in the same way tells the story of water-gas, so that you may see the difference in the process. It gives us a very good idea of the way in which the steam goes through the bed of hot carbon, and shows how the gas is enriched by oil.

Pictures on pages 635, bottom of 637, 639, 645, courtesy Consolidated Gas Co.

THE BEGINNING OF TWO KINDS OF GAS

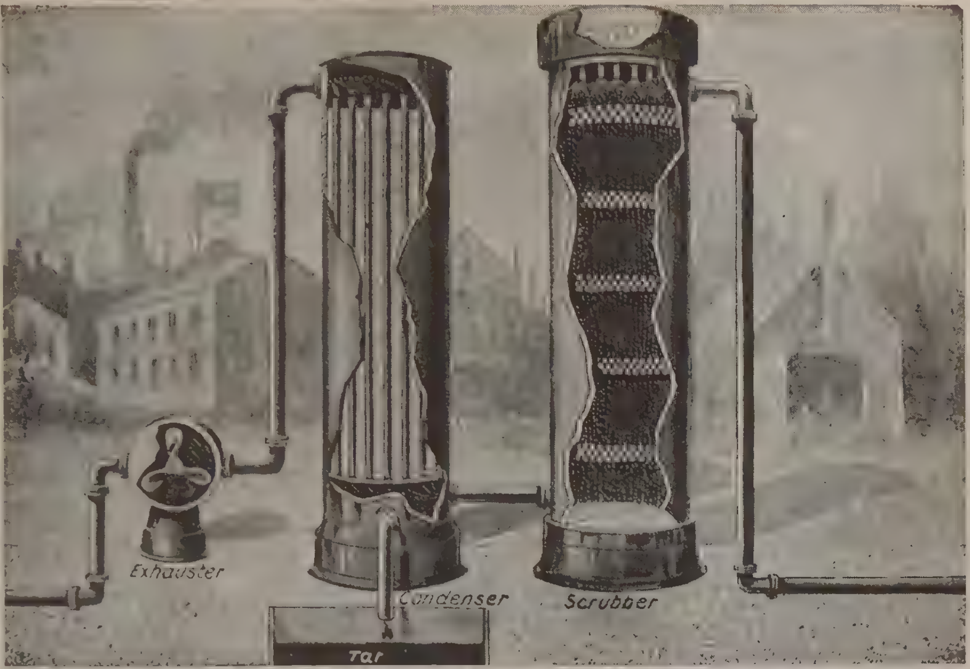


In this picture and those following we see the principle of gas-making as practiced to-day. This picture shows us the inside of the retort-house. The retorts are stoked up, and the gas, mixed with various other vapors, is driven off through a hydraulic main, shown at the top. Some of the tar and oil condenses.

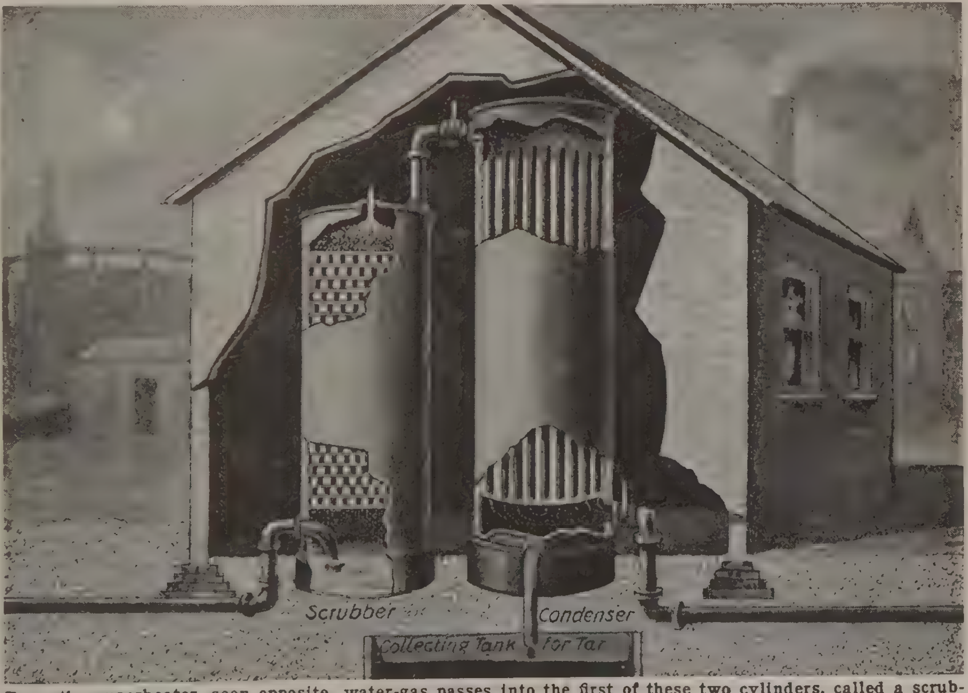


Water-gas is produced by passing steam over red-hot coke in a generator. The gas then passes into a carbureter, where oil is sprayed over a network of hot bricks and is changed into gas, enriching the water-gas. The superheater is very much like the carbureter. When the steam cools the coke in the generator, it is shut off, and air is pumped through from below to heat the coke up again.

THE GAS GIVES UP ITS TAR AND OIL

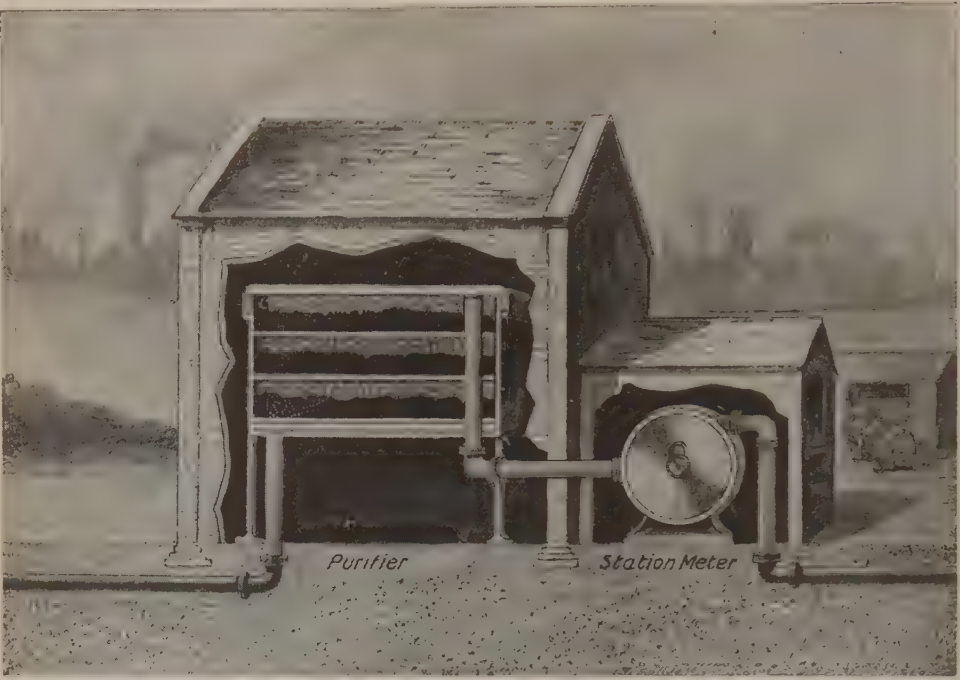


Coal-gas drawn from the hydraulic main, seen on the opposite page, by an exhauster passes through the condenser, the big cylinder on the left. Water around these tubes cools the gas and condenses the tar and oil which flow out below. The gas passes from the condenser into the cylinder on the right, called a scrubber, where water washes the impurities down, and collects the ammonia.

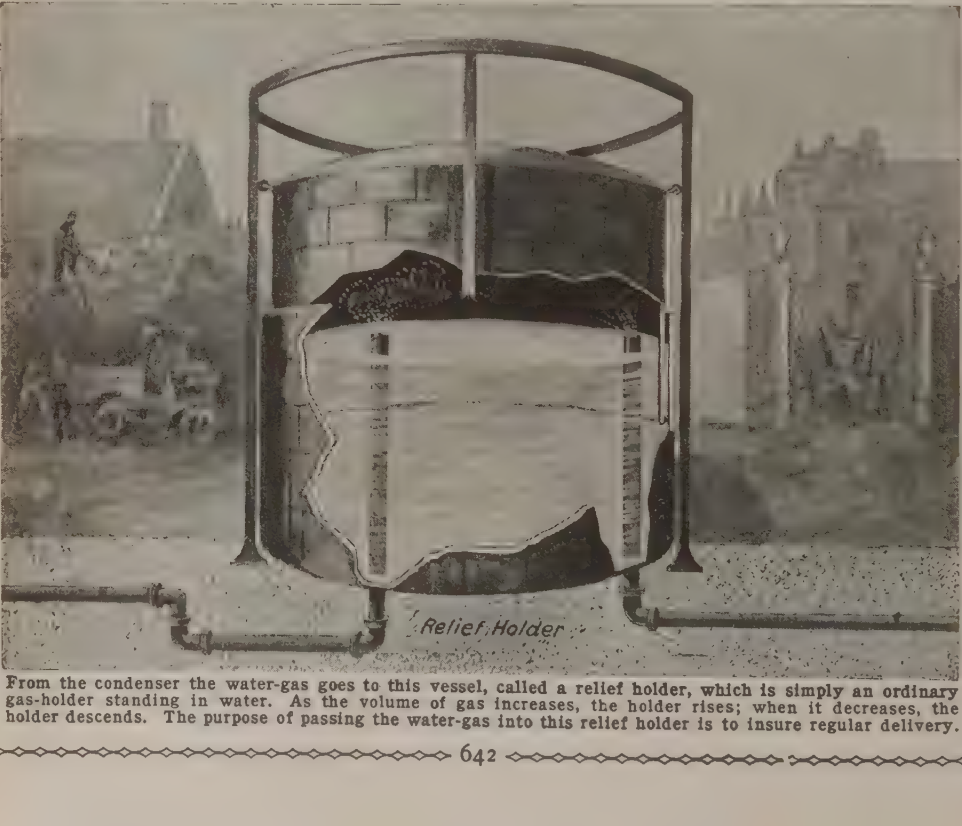


From the superheater, seen opposite, water-gas passes into the first of these two cylinders, called a scrubber. Water is sprayed from the top, washing the tar and carbon out of the gas. These fall into a tank. The gas passes into a condenser very similar to that used for coal-gas. The tar is condensed and collected, and the gas passes on for the next process.

REGULATING THE GAS SUPPLY

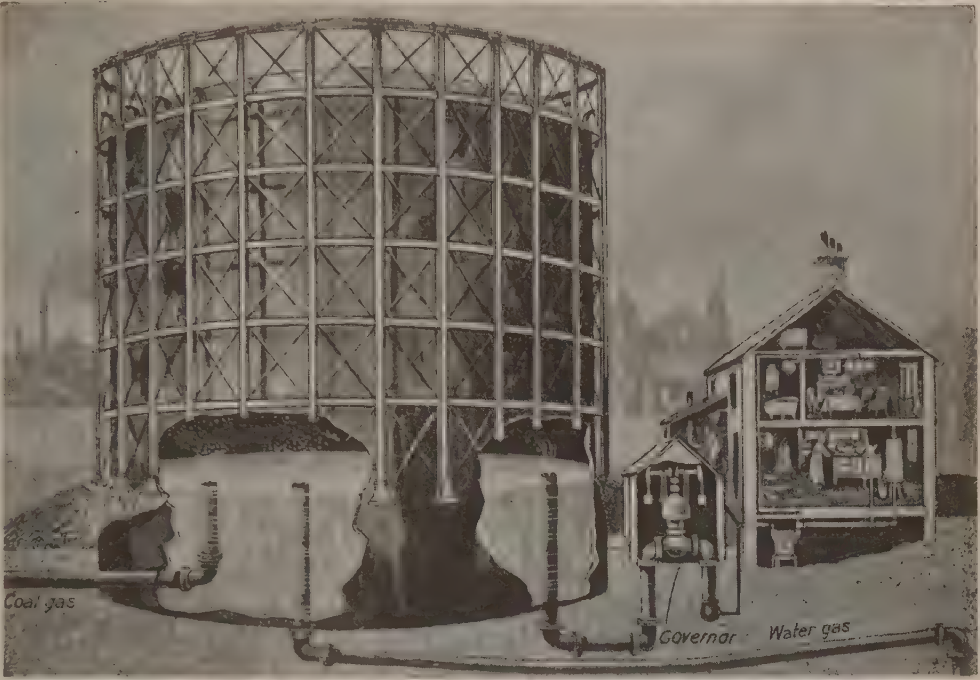


After the ammonia and other impurities have been washed out in the scrubber, the coal-gas goes to the purifier, where it is passed over trays of oxid of iron, and the sulphur impurities are absorbed by the iron. Under the purifier is a pile of iron oxid. The gas now passes through the station meter, page 645.

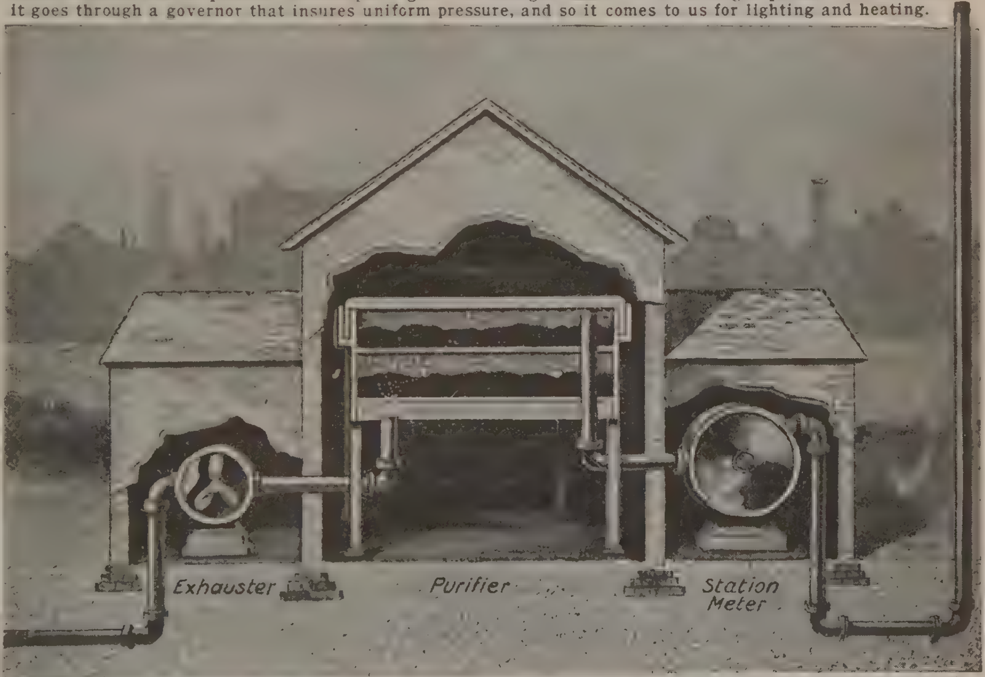


From the condenser the water-gas goes to this vessel, called a relief holder, which is simply an ordinary gas-holder standing in water. As the volume of gas increases, the holder rises; when it decreases, the holder descends. The purpose of passing the water-gas into this relief holder is to insure regular delivery.

THE TWO GASES ARE MIXED READY FOR USE



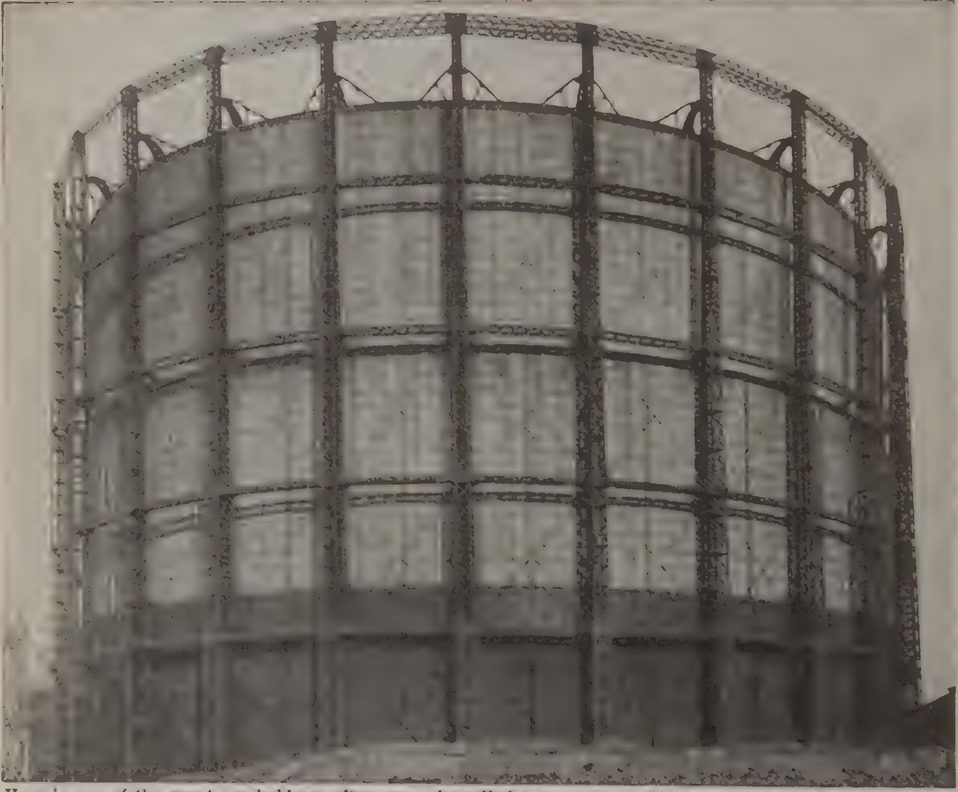
After passing through the station meter, seen on page 645, coal-gas goes to the gas-holder. Like the relief holder for the water-gas, this is made in a series of telescopic sections. The various sections have water-sealed connections to prevent the escape of gas. As coal-gas mixed with water-gas passes from the holder it goes through a governor that insures uniform pressure, and so it comes to us for lighting and heating.



When the water-gas leaves the relief holder shown opposite, it sometimes passes through a shaving scrubber, a steel tower filled with wood-shavings to catch any drops of tar still remaining. This, however, is often omitted, and the gas is drawn out of the relief holder and driven into a purifier, as with the coal-gas. It then passes through a station meter and into the gas-holder, where it is mixed with coal-gas.

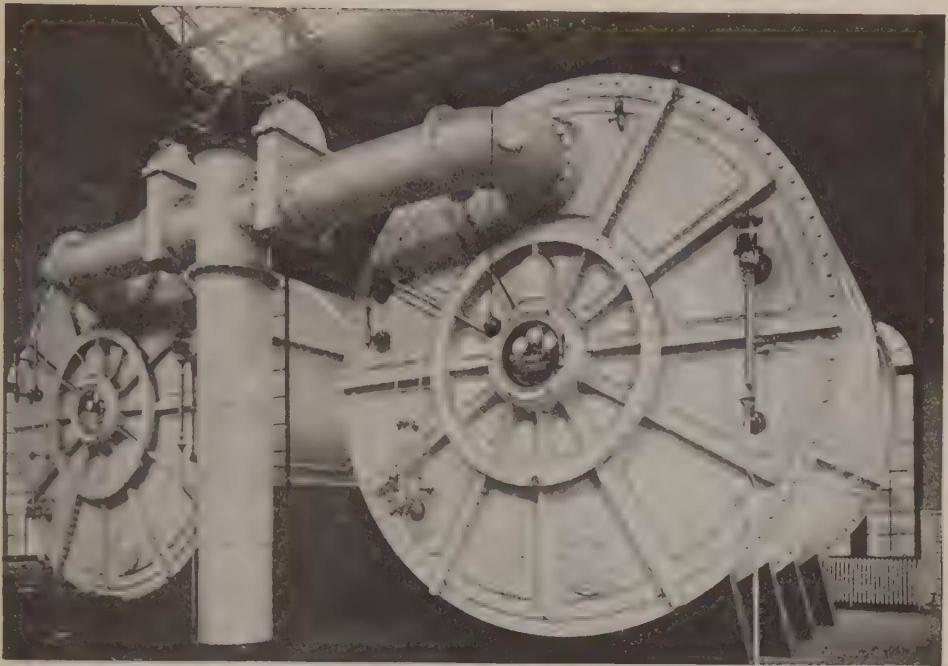
THE GAS REACHES THE GREAT HOLDER

When the gas has been extracted from the coal, coke is left, and as this is emptied from the retorts it is cooled and carried away automatically by means of an endless chain conveyor, which empties it as required.

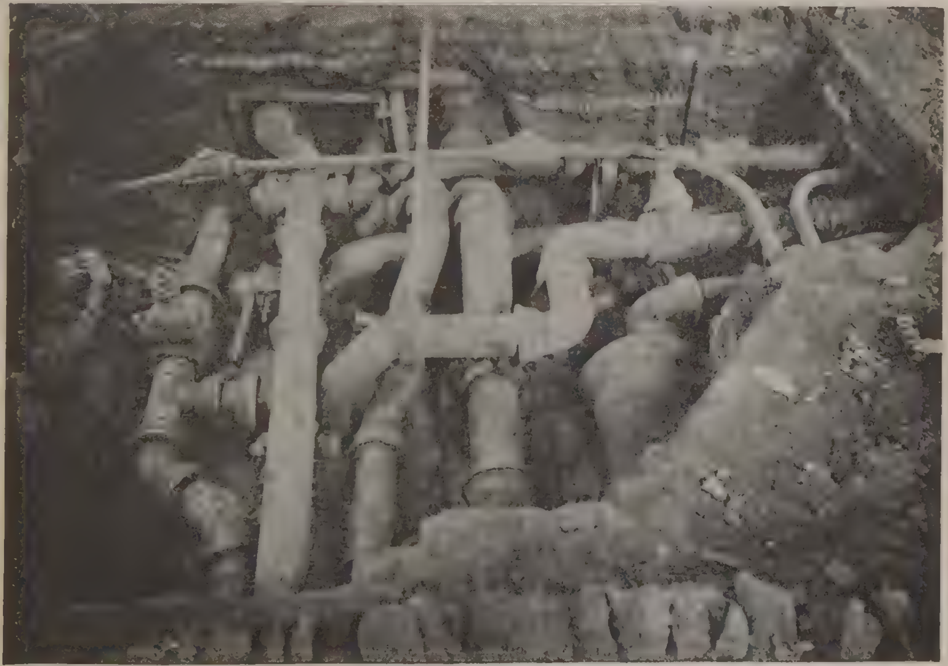


Here is one of the great gas-holders, often wrongly called a gasometer. It is made on the principle of the telescope, and as the gas enters from below the gas-holder rises. This gas-holder is full.

HOW GAS IS BROUGHT TO OUR HOUSES

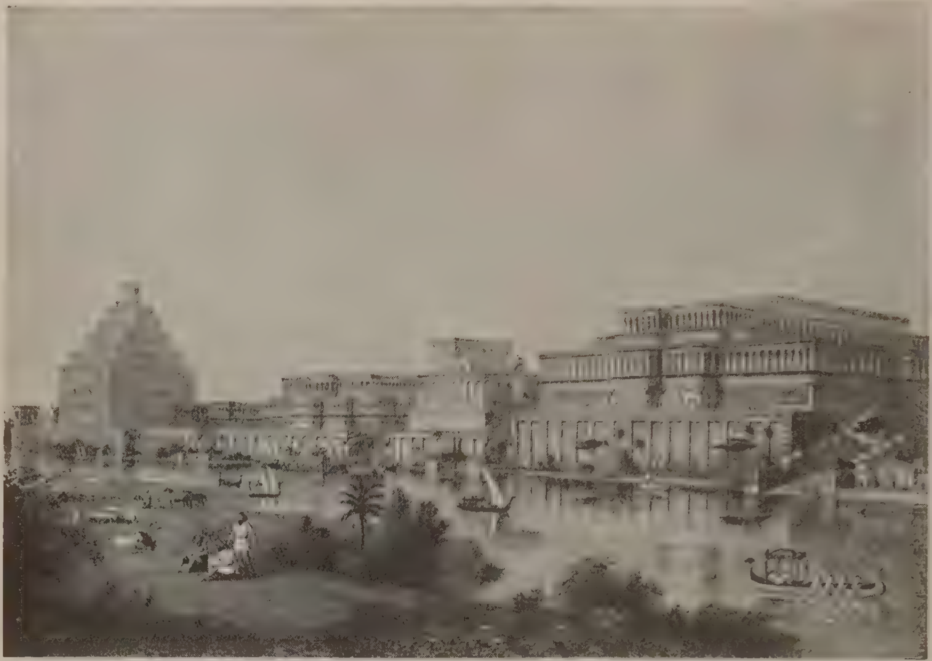


This shows two of the great meters which measure the gas as it flows from the purifiers into the tanks, or holders, in which it is stored for use. The gas rises in the centre pipe, and its flow to the meters can be controlled by the mechanical contrivance which we see close to the openings into the pipes which lead into the drum. The dials in front of the meter show the quantity of gas in the tank.

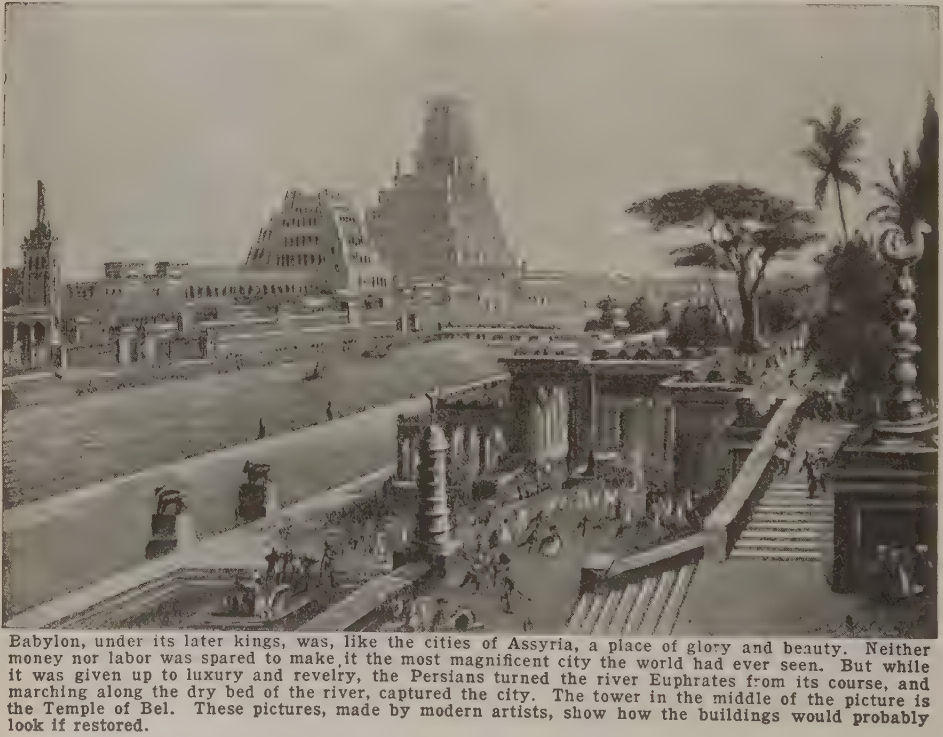


From the holders the gas is forced into large pipes like those shown on page 635. From these main pipes it goes into smaller pipes which distribute it through the streets, and from the street pipes it flows into smaller pipes through which it is carried into our houses. This picture gives us an idea of the many miles of pipes, large and small, making a network of gas lines underneath our city streets.

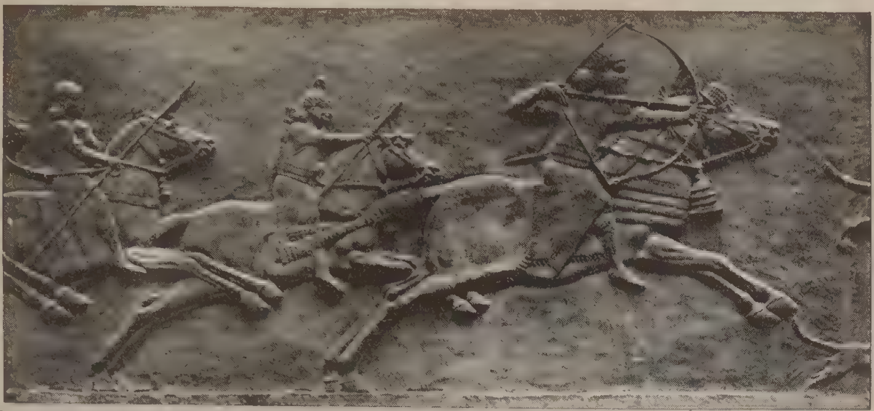
PALACES OF ASSYRIA AND BABYLONIA



The rulers of Assyria built for themselves many magnificent palaces and temples. One of their most wonderful palace-cities was Calah, about twenty miles from Nineveh, and from this picture we get some idea of its splendor when it was the flourishing capital of the empire under King Ashur-nazir-pal. In the ruins of a palace at Calah, now called Nimrud, the great bull shown on page 649 was found.



Babylon, under its later kings, was, like the cities of Assyria, a place of glory and beauty. Neither money nor labor was spared to make it the most magnificent city the world had ever seen. But while it was given up to luxury and revelry, the Persians turned the river Euphrates from its course, and marching along the dry bed of the river, captured the city. The tower in the middle of the picture is the Temple of Bel. These pictures, made by modern artists, show how the buildings would probably look if restored.



The famous king of Assyria, Ashur-bani-pal, hunting wild beasts in the company of his attendants.

BABYLONIA AND ASSYRIA

LIFE IN THE WORLD 7000 YEARS AGO

CONTINUED FROM 574

THE ASSYRIAN GOD OF DARKNESS

CAN you listen to the names Ashur-bani-pal, Tiglath Pileser or Nebuchadnezzar without seeing visions of fighting hosts and dashing huntsmen and strange old palaces in faraway lands? And what comes to your mind when you hear of the Hanging Gardens, the Tower of Babel or Ur of the Chaldees? These, like the names in Egypt—Memphis, the Nile, the Pyramids—are magic keys that can open doors into very ancient empires built up around river valleys by men who were learning for the first time things that seem commonplace to us, so familiar are they now.

Egypt and the river Nile are in the northeastern corner of Africa, you know. Starting from there and crossing the Isthmus of Suez or a bit of the Mediterranean Sea, you will come to the western edge of Asia; there, moving eastward across desert land, you will reach a valley wider than that of the Nile, for here are two rivers, the Euphrates and the Tigris, which rise in the hills of the west and north, and flow southeast, more or less side by side, till they meet in one stream, which passes into the Persian Gulf. One of the old names for the land between these two rivers, and that by which it is best known, is Mesopotamia, which means "the land between the rivers." Mountains form a ridge east of the Tigris basin, and beyond them lies the land of Persia, where once the old Elamites had their capital, the ancient city of Susa.

That there had been a great past in the land between the rivers was known through all time, not from gigantic monuments still standing, like those in Egypt, but partly from the echoes of old stories and legends handed down from generation to generation, partly from accounts of kings of the country who were closely connected with the history of the Jewish nation, and partly from the writings of old authors, such as Herodotus, who visited the country in the course of the centuries.

But the face of the land itself was silent and without expression, giving no clue to the details of the glorious past. At least, so it seemed until about a hundred years ago, when first one traveler and then another began to wonder about the great mounds which are dotted all over the flat country.

Sometimes Arab villages are built on these mounds, and crops are cultivated on their sides; in spring they are gay with wild flowers. There are most interesting models of some of the mounds in the Louvre Museum in Paris. For both French and English were at last roused to send explorers to dig down into the rounded hills to find out what secrets they held. Little pieces of carved marble had been washed out by the heavy rains, and had given an idea of what might lie below.

THE LOST EMPIRE THAT LAY BURIED UNDER THE DUST OF AGES

Just then the world was waking up to take real interest in finding out the truth about the past, by collecting and studying the treasures that Mother Earth had kept so long in safety.

In course of time, with infinite labor and difficulty, delays and dangers, the explorers, French and English, succeeded in showing that in the mounds, hidden under the dust of ages, lay the remains of the life of the great past in the valley of the two rivers. Records which had been long thought entirely lost were brought to light.

As more mounds and sites are dug over, in Mesopotamia and the surrounding countries, the study of the interesting objects found in them unfolds a long, absorbing story, chapter by chapter. And the surpassing wonder of it is that these records had been buried, out of sight and out of memory, for more than two thousand years.

THE LITTLE GRAY CYLINDERS THAT UNVEIL A WORLD OF WONDERS

Now, the things found in the mounds are very different from those in the tombs of Egypt. To begin with, there are no mummies, no personal possessions like those that bring us into such close touch with the old Egyptians, no vivid colored paintings, no illustrated papyri. When we begin to walk about the Babylonian and Assyrian galleries in the great museums, the man-headed monsters of gray stone, the slabs carved with strange-looking reliefs, the clay cylinders and little tablets like cakes of soap, covered with writing, the small roller seals, may look uninteresting and dull when we contrast them with the dolls and toys, furniture and shoes of the Egyptian galleries.

But as we learn more about them the apparent dullness vanishes as by magic, for by means of them we are led right into the gorgeous palaces of the kings of Assyria, whose names and doings are so familiar to us in Bible story. And centuries farther back we may go into the busy country life of old Babylonia, when the rivers, kept in by embankments and connected by canals, were covered with boats and barges, carrying the produce of well-watered and fertile fields. We can almost smell the sweet hay, and see the chaff flying, and hear the cattle lowing, and enter into the bustle of sending these things to market—all more than four thousand years ago.

By means of these tablets and slabs, too, we may get first-hand particulars of the gorgeous temples of the Sun and Moon gods, from whose worship Abraham fled, when he went to found a nation that was to worship only one god, the great unseen Jehovah.

A MAN WHO SWUNG OVER A ROCK TO GET THE KEY OF THE PAST

For a key to the writing that covers so many objects found in the mounds was discovered at last. Until then the arrow-headed signs on tablets of clay and slabs of stone had been as perplexing as were the hieroglyphics of Egypt before the Rosetta Stone was unearthed and their puzzle worked out. On the Rosetta Stone, as you may read on page 814, an inscription in a known language, Greek, made a basis for translation. But the opening-up of the meaning of the *cuneiform* (wedge-shaped) characters in the mounds of Assyria was not so easily reached, as you shall see.

It was a soldier who found the Rosetta Stone, and it was an English soldier, Sir Henry Creswicke Rawlinson, who found a stone that showed him how to read the cuneiform writings. But his stone was the face of a high rock cliff at Behistun, where a king had had inscriptions carved in three cuneiform languages thousands of years before. Rawlinson, more interested in languages than in anything else, climbed and clung and perched and swung on the face of that cliff in most dangerous and difficult situations until he had made copies of the inscriptions which he could study and decipher. At last he and other scholars had the joy of being able to read the message of the long-buried past, which, as one of the old kings said, had been written on the stones and clay for all nations and for all time.

PICK AND SPADE AMONG OLD PALACES

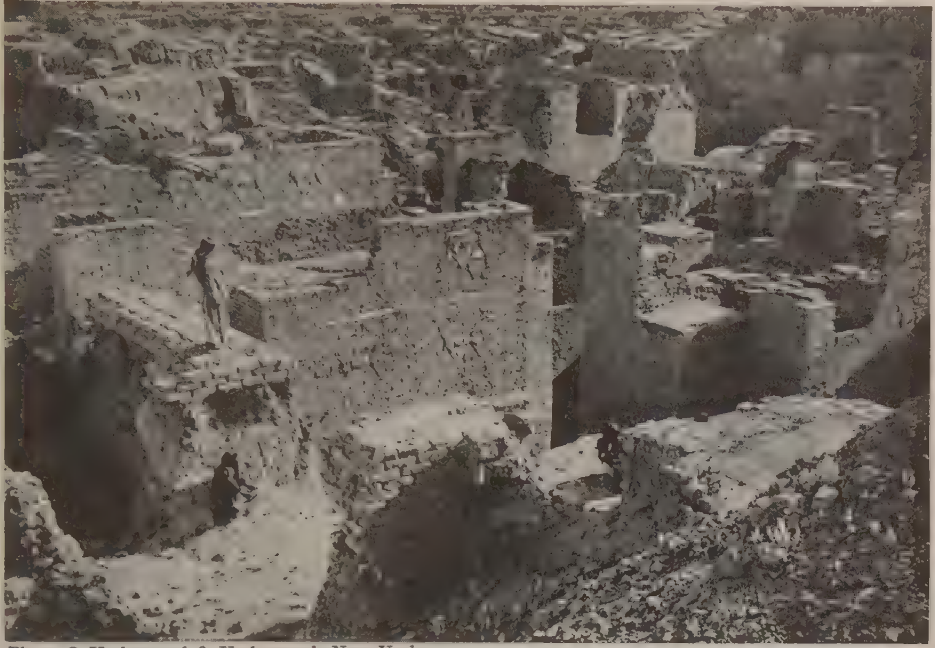
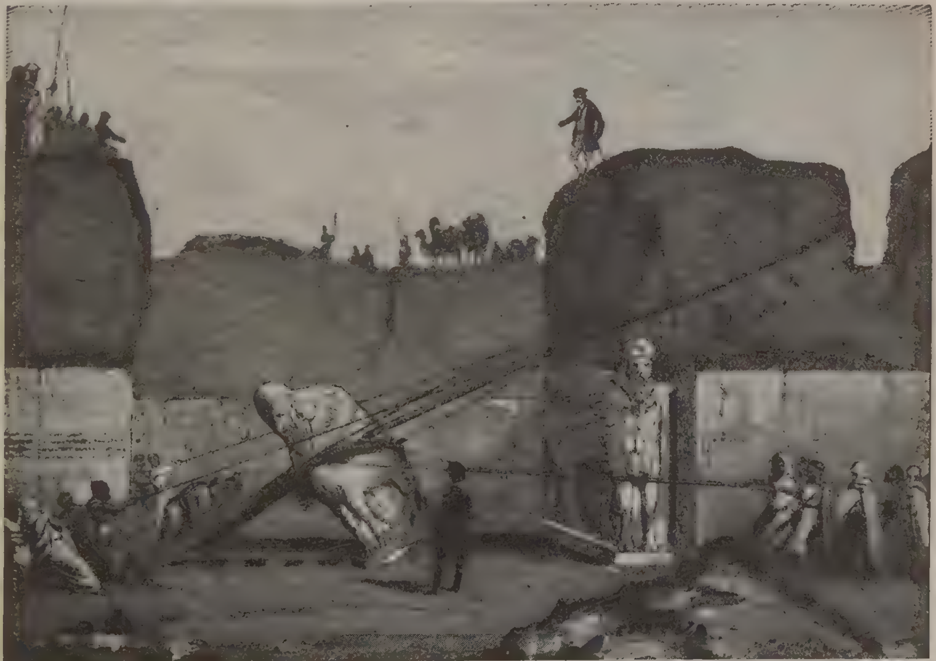


Photo © Underwood & Underwood, New York.

"By faith the walls of Jericho fell down" in the Bible story. By faith and by hard work the walls of Babylon and other old, old cities have come to light in modern days. The faith of men who in a barren hill could see a vision of buried palaces and temples has proved ancient history by revealing such remains as these walls of Nebuchadnezzar's Babylon.



Sir Henry Layard was one of the pioneers of Assyrian research. Digging beneath a mound at Nimrud, near the river Tigris, which he supposed to be the site of an ancient city, he discovered the remains of a palace, and among other relics that he sent home to the British Museum was a huge winged bull with a human face. Great difficulty was experienced in lowering it so as to carry it to the river. When it was near the ground the supporting ropes suddenly broke. The bull fell, but was not injured.

On the stone monsters, and on the slabs and monuments and walls of the temples, the cuneiform characters were chiseled out with tools. On the clay cylinders and tablets they were pressed in, while the clay was still moist, by a stylus with a specially shaped point. Afterward the cylinders and tablets were dried in the sun or an oven.

THE BOOKS OF STONE AND CLAY THAT NOTHING COULD DESTROY

These cylinders and tablets are the books and letters of the country. What would be left of our books and letters if they had gone through the changes which have passed over these, with buildings burning down around them and dampness oozing in where they were buried in the destruction of great cities? But those old books and letters of clay were indestructible, only baked the harder by the flames of burning palaces.

The story of Mesopotamia was not like that of Egypt—one more or less unbroken whole through several thousand years. The language, writing and religion of the country did not remain the same, nor was the land all the time under more or less the same form of government.

As we pass along the centuries in the valley of the Euphrates and Tigris we shall hear of an entire change of race in early years, of a mighty division in the country later on, of incessant and terrible wars, not only between the rival kingdoms of Babylonia and Assyria, but with all the nations round. Among these were: on the west, the Hittites, the Syrians, the Canaanites—part of whose land was taken by the Hebrews when they came out of Egypt; and on the east, the Elamites, the Cassites, and the Medes and Persians.

THE RIVER THAT HAS DRIVEN THE SEA FARTHER AND FARTHER BACK

In Mesopotamia the earliest people that come into history were of the same Mongolian stock as the Chinese and Finns, and even they pushed out a still earlier people of whom little is known. When Menes in Egypt was building his capital, Memphis, and turning the course of the Nile to make more room for it, as we read on page 814, there were already many large cities, each with its powerful ruler, near the mouth of the Euphrates—quite a different mouth from that through which the river flows to-day.

There is no strong current in the Persian Gulf, as in the Mediterranean, to wash away the sediment of sand and mud brought down by the Tigris and Euphrates rivers, which once had separate mouths. So all through the years—and it is still going on—new seashore has been formed of that sediment, ever pushing back the waters of the gulf. Scholars have calculated how long the miles of new seashore have taken to form, and by that means they guess at the age of the old cities which were seaports when first built, but whose sites are now far inland.

This lower part of Mesopotamia, the gift of the two rivers, is often called Chaldæa, especially in the Bible, and other very old names for it are the Land of Shumer, or Sumer, and Akkad.

The Sumerians and Akkadians, the Mongol peoples who are believed to have come down from the heights that surround the wide plain, made of it a very fertile land. They had good draïnage and irrigation, and tilled the soil so that they could grow grain and dates and figs, and could keep much cattle in the rich pastures. These ancient people were great temple-builders, too, as is shown by the bricks and gate-sockets, stone slabs and other remains found in the old cities of Ur, Shirpurla, Erech and others.

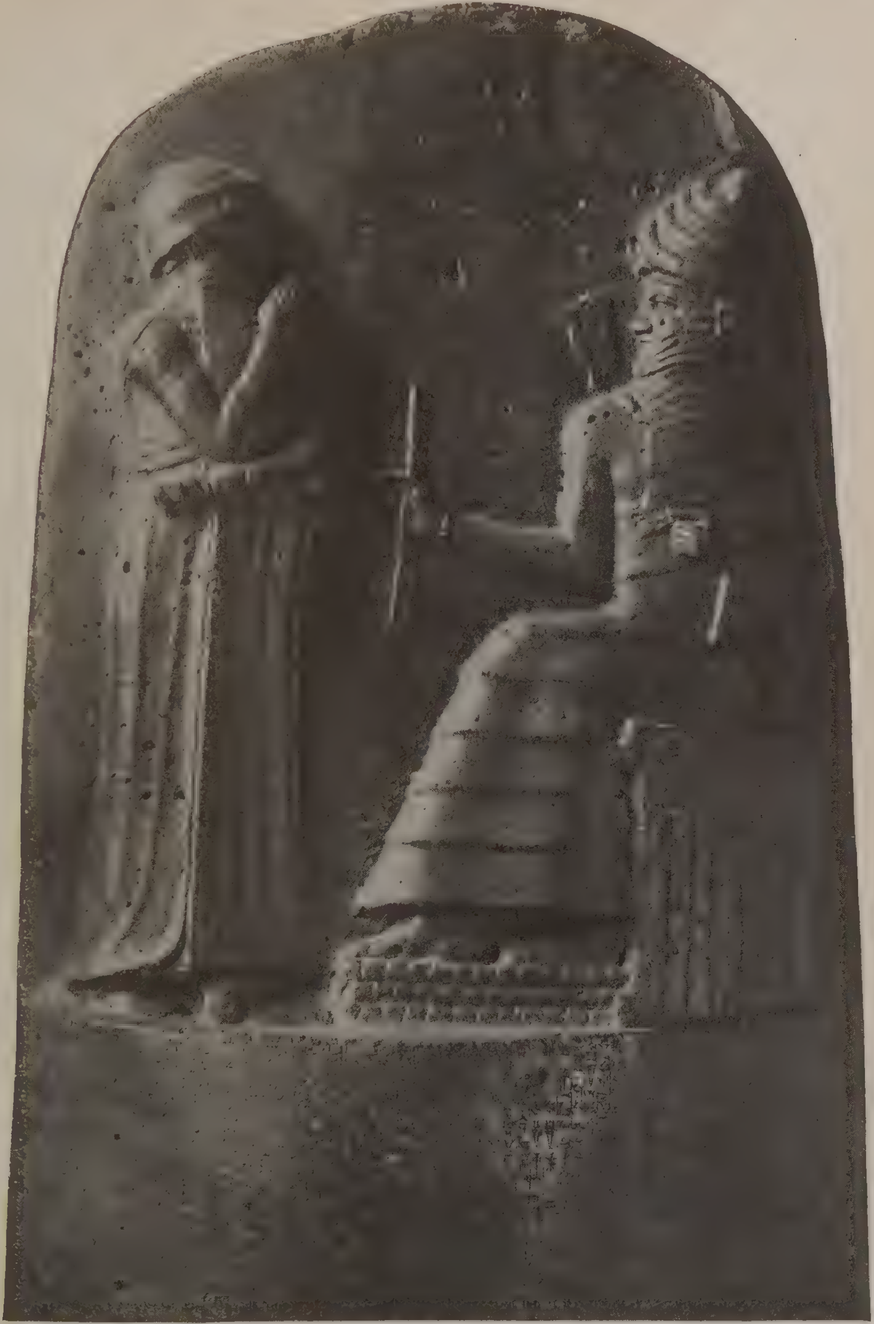
THE OLD DICTIONARIES THAT WE CAN SEE IN THE BRITISH MUSEUM TO-DAY

As long as 4,000 years before Christ their language was fully formed and was expressed in a picture-writing, modified as the years went on, somewhat like that of the old Egyptians.

These Sumerians—all shaven and shorn in the portraits that have come down to us—loved learning of all kinds as much as they loved agriculture and building. When, about 3,800 years before Christ, they were conquered by a race of quite different stock, with beards and flowing hair, who had long lived to the north and west of them, the Sumerians were not driven out. On the contrary, they taught these Semitic invaders much of their civilization and gradually, through many centuries, the races mixed together, and the country became known as Babylonia, from its capital, Babylon, on the banks of the river Euphrates.

The old language, in which were written accounts of the religion and laws, lasted for a long time, and was learned by the invaders as they settled down. The

UPPER PART OF THE STELE OF HAMMURABI



This stele, or tablet, of King Hammurabi, the builder of the Babylonian Empire, is inscribed with the famous code of laws drawn up by the king for the governing of his people. These laws were written in forty-nine columns of hieroglyphics. At the top of the tablet the king is represented as in the act of receiving them from the Sun God, Shanash, who is seated on a throne in the form of a temple façade, with his feet resting upon the mountains. The stele is one of the most important sources of information about the life and customs of the people of the time. This greatest king of Babylon constructed the famous Royal Canal of Babylon and a great promenade along the river Tigris. Interested in securing justice, he was proud of being called "the king of righteousness." His tablet you may see in the Louvre in Paris.

grammars and dictionaries and translations that they used we can see in the cases of the British Museum to-day. Just as the Roman alphabet is used nearly all over Europe for the writing of various languages, so the old Sumerian picture-writing, which gradually developed into wedge or arrow-headed signs, was used not only by the Babylonians and Assyrians themselves, but by many of the nations around. A great name stands out among the rulers of the newer race, that of Hammurabi, king of Babylon, who lived more than two thousand years before the time of Christ. He may have been living at the time when Abraham and his family are believed to have made their hasty departure from Ur of the Chaldees, to wander with their flocks and herds in the lands on the other side of the desert.

THE JUST LAWS THAT GOVERNED MEN FOUR THOUSAND YEARS AGO

One of Hammurabi's many claims to greatness is that he was a great lawgiver. Some say that his code of laws is the oldest in the world. On page 651 you can see a picture of the pillar on which he inscribed them. His portrait at the top shows him, a man with a long beard, in the act of receiving the laws from the Sun God. He set up many copies of the pillar, so that his subjects in different parts of his dominions could find out their just rights before going to law.

Some tablets, round in shape, give the measurements of fields and estates, and bring us a picture of the carefully tilled land. Boundaries were often difficult to keep in such a flat country where there were frequent floods in spite of all the work done on the embankments. This explains why so many boundary stones of all dates have been found. They are inscribed with pictures and writing.

Other tables, square in shape, relate to the wages of the workers in the fields, children as well as men and women, and to the levying of taxes and all sorts of business. Some had to do with loans and repayments, and the buying and selling of houses, fields, slaves and many kinds of goods.

THE GREAT PLATFORMS ON WHICH THE TEMPLES OF BABYLON WERE BUILT

The great industry of the country, besides agriculture, was brickmaking, for stone was very scarce and clay was abundant. Enormous numbers of bricks were needed, for it was customary to set up the great buildings, temples and palaces on huge platforms made of sun-dried bricks, which raised them out of the way of the floods. Harder bricks were used for facing and ornamental purposes, many of which bear the names of kings and accounts of the buildings they set up. It was the custom, too, to build high broad walls of brick round the large cities.

HOW ASSYRIA WAS FOUNDED IN THE HILL COUNTRY

All the time that building, agriculture and trade were thus flourishing in Babylonia the people were becoming more and more numerous, and at last they began to go out as colonists northward, in the higher valley of the two rivers, where the country rises toward the hills beyond and the climate is more bracing. They built large cities, of which Nineveh, on the Tigris, was the chief; and the plan they followed was the same plan as in the old cities. The new ones, too, were built on raised platforms, though natural hills were near by, and the same sort of brick was used, though quarries of building-stone were within easy reach.

As centuries passed the people became strong enough to break off from Babylonia. Then their country, under a king of their own, became known as Assyria, which means "the land of the god Ashur." This was about the eighteenth century before Christ.

ASSYRIA BECOMES WARLIKE AND FIGHTS WITH HER NEIGHBORS

The Assyrian character, influenced no doubt by the more invigorating air of the northern country, became more bold and warlike as time went on. Less interest was taken in the peaceful pursuits of trade and farming, and a great passion for war and conquest took its place, partly, perhaps, forced on the people by the constant attacks of the powerful nations that lived round about.

As far back as the time of Hammurabi there had been fierce struggles between the Babylonians and the Elamites and their northern neighbors the Cassites. The Cassites succeeded in overthrowing the Babylonian kings, and their power lasted in Babylonia some time after the great division of the two kingdoms. We read on page 816 how the kings of Egypt gradually extended their power across the Isthmus of Suez and over the states that lay between them and the great

THE MADNESS OF KING NEBUCHADNEZZAR

Although by his ability and his military prowess Nebuchadnezzar restored Babylonia to the position of first empire in the world, his mind gave way, and for a time he was as a beast of the field. The prophet Daniel, who tells us of this madness, says: "He was driven from men, and did eat grass as oxen, and his body was wet with the dew of heaven, till his hairs were grown like eagles' feathers."

kingdoms in the valley of the Euphrates and Tigris. Amenophis III of Egypt made these states pay tribute, and he took great delight in hunting lions in these countries.

THE FINDING OF THE TABLETS THAT TELL THE STORY OF THE PAST

He married a lady of western Asia, who influenced her son so much toward the religion of her country that he gave up the old Egyptian religion and set up a temple in a new city on the Nile, in which to honor the splendor of the sun's rays. In the ruins of this city were found the famous Tel-el-Amarna tablets, inscribed in the arrow-head, or cuneiform, writing. They opened up a whole chapter of most interesting history, hitherto quite unknown, showing the relations between the kings of Egypt and the kings of western Asia in the fifteenth century before Christ. There is a table-case full of them in the British Museum, with translations beside them. In them Egyptian governors of provinces in Asia beg for help against rebellious subjects and for supplies of food. Proposals of marriage for princesses of the royal houses are made with due ceremony, and much discussion follows as to dowries and presents, such as chariots and horses, gold and ivory.

Incessant war seems to have gone on in the fourteenth century before Christ between Babylonia and Assyria, in which the Cassites were much mixed up. Then a century later Assyria conquered the old mother-country of Babylonia under a king named Tukulti-Adar I. With few intervals, for some centuries Assyria held the proud position of leading power of western Asia.

KING DAVID'S FRIEND, TIGLATH PILESER, THE WARRIOR KING OF ASSYRIA

One of the most interesting of the early Assyrian kings is Tiglath Pileser I, believed to have been the friend of King David of Jerusalem; he lived toward the end of the twelfth century before Christ. There are delightful accounts in his cylinder inscriptions of the expeditions of the doughty old warrior, especially of the one he made when he "mounted" a ship, evidently for the first time, for a trip on the Mediterranean, in company with his allies the seafaring Phœnicians.

The kings who reigned during the two and a half centuries which covered the time of Assyria's greatest glory and power were notable men, and it is their palaces and temples that have been dug out of the mounds of Nineveh and its neighborhood by Monsieur Botta, Sir Henry Layard and other great explorers. To these palaces the kings returned in pomp and triumph after vanquishing and sending into exile many of the neighboring nations, including the people of Israel.

The huge man-headed bulls of stone used in the palaces of ancient Assyria are astonishing both in form and in size. The rows of curls in the hair and beard are in the typical Assyrian fashion. The great wings are finely carved, and there are five legs to each, because they were to be viewed either from the front or the side. The front view must have two legs, and the side view four, as you may see on page 649. These monsters representing the strength of a bull, the swiftness of an eagle, and the intelligence of a man were set at the entrances of the palace halls.

THE GREAT WINGED MONSTERS GUARDING THE FOOTSTEPS OF THE KING

"Guardians of the footsteps of the king" these monsters were called, and imposing they must have looked when set up in their original places, in the wide courts lined with pictured stone slabs, glowing at that time, it is believed, with brilliant colors. Enough of the slabs were carried over land, river and sea to line the walls of several galleries in the British Museum in London. They tell us about the deeds of some of the best known of the kings of Assyria in the time of its greatest glory, from the ninth to the seventh century before Christ. They were all great warriors, great builders and great hunters—and three of them, at least, were great collectors of books.

From the grave-mound of the ancient city of Calah were dug out the remains of the palace of Ashur-nazir-pal, a long name that means "Ashur protects his son." Very lifelike are the portraits in relief on the slabs, showing Ashur-nazir-pal conquering his enemies, on the march and crossing rivers. Particularly interesting are the pictures of soldiers swimming on skins blown out like air-balloons, and those of the horses swimming quietly behind the barge which carries the king's chariot; and the king himself looks very imposing as he pours out offerings to the gods over the bodies of bulls and lions he has killed.

A BLACK STONE THAT TELLS THE HISTORY OF A FAMOUS KING

The son of Ashur-nazir-pal, Shalmaneser II, also built a palace at Calah, and on a famous black obelisk of his we have the account of the expeditions he made during his long reign. The sculpture is in bands, and shows processions of the conquered peoples bringing tribute of dromedaries, elephants, apes and horses. The second band is very interesting to us, for it records the tribute of Jehu, king of Israel, consisting of all kinds of vessels of gold. Tiglath Pileser III, called by his Babylonian name of Pul in the Bible, lived about a hundred years after Shalmaneser II. His inscriptions and pictured slabs show him to have been very warlike. We see him assaulting a city, the gods being borne off in procession; in another place he is standing with his foot on the neck of a foe.

In still another picture we may see flocks and herds being driven away, and women and children being taken off in a cart. It was Ahaz, king of Judah, who asked Tiglath Pileser III to help him against his enemies, with the result that the terrible doom of being carried into captivity fell first upon the Israelite tribes across the Jordan.

CARRYING THE CONQUERED PEOPLES AWAY INTO DISTANT LANDS

This plan of carrying away conquered peoples far from their homes and replacing them with others from some other distant part of the empire caused bitter suffering through the years of Assyria's greatness, as the wailing dirges of the Jews, which we still sing and read in our services, remind us: "By the rivers of Babylon, there we sat down, yea, we wept, when we remembered Zion."

When Sargon II became king of Assyria he took Samaria after a long siege, and sent its inhabitants far away from their homes to settle beyond the Euphrates. From his splendid palace near Nineveh came the fine man-headed bulls, and the cuneiform writing upon them tells of his expeditions; so does that on his cylinders found among other records.

The cylinders of Sargon's famous son, Sennacherib—so well known to us in Bible story—are full of most interesting details, for he fought many campaigns and built and restored many palaces. The slabs from one of his palaces, now in the British Museum, are of absorbing interest, for they show in a lively fashion how the great palaces in Assyria were set up. We can distinguish the files of men making the platform mound on which the buildings were raised. They mount with loads of stones, bricks and earth, hurl them down, and then descend to refill their empty baskets and hasten up again. There are great crowds of workers in every direction—surely slaves and prisoners—for all are kept in order by overseers and taskmasters with threatening sticks in their hands.

THE BUSY SCENE WHEN THE WINGED MONSTERS WERE MOVED ABOUT

Numbers of them are straining at long ropes, hauling a sledge running on rollers, eased by wedges of stones and a powerful lever worked by pulleys. On the sledge is one of the monsters to be set up as "guardian of the king's footsteps." His curls and sash are not in place yet, for he is still in the rough, fresh from the quarry whence he has come by boat.

We can see the boats or rafts made of trunks of trees lashed together on the river close by, with the eels wriggling about, and the little pigs with their mother among the reeds.

But we must turn again to the workmen, hastening hither and thither with all sorts of tools and building materials, and from them to the impassive soldiers keeping guard over the person of Sennacherib himself, gorgeous in patterned cap and fine tunic, standing in his splendid car, with a fine umbrella over his head, and fly-flaps waved by attendants. It makes us think of the Pharaohs watching the rising of the Pyramids.

What heat and dust and noise the whole scene suggests! Over the king's head runs the inscription: "Sennacherib, king of multitudes, king of Assyria, had the bulls and colossi set up with joy. They were made in the land of the Baladōn—near the source of the Tigris—for the palace of his lordship, which is within Nineveh."

THE GREAT CART THAT THREE HUNDRED MEN COULD NOT PULL

More than three hundred men were needed to pull the cart on which one of the Assyrian bulls was placed, some twenty-six centuries later, when Sir Henry Layard had it dug out of the mound and astonished the natives by sending it home to England.

On another slab there is a picture of Sennacherib sitting on a throne like an armchair, receiving from his chief officers the report of the taking of the city of Lachish. Flushed with his success, Sennacherib sent a threatening message to Hezekiah, king of Judah, who had dared to withhold the tribute he had agreed to pay. As the king of Egypt had encouraged Hezekiah to take this bold course, Sennacherib was furious with him too, and hastened down to the borders of Egypt to settle with him first. But the battle was never fought. By a plague or some other great disaster the flower of the army perished in one night, and Judah, as well as Egypt, for the time escaped.

Under Esarhaddon, the son of Sennacherib, and his famous son Ashur-bani-pal—a name that means "Ashur creates a son"—the two great nations of Egypt and Assyria came to very close quarters, for the Nile delta was conquered by the Assyrians, and the terrors of war were carried far up the fertile Nile valley. The annals of the conquerors give a piteous picture of the destruction of crops, the misery of the people, and the plundering of cities and temples. Ashur-bani-pal was the strongest of all these strong kings, and many stories of his riches and greatness lingered through the centuries, much mixed up, as we know now, with legend and fable.

THE POWER AND POMP OF THE CONQUERING KING OF MULTITUDES

It is amazing to think of the power in the hands of this one man, as he stands there in his gorgeous clothing, his dazzling ornaments and embroideries and rosettes. He was king over multitudes—not only over his own people and race in the valley of the two rivers, in their immense cities and fertile fields, but also of the nations round, from the Sea of the Rising Sun to the Sea of the Setting Sun—from the Persian Gulf to the Mediterranean.

He lived through many years of campaigns, in which were conquests, as shown on the pictured slabs, full of cruelties one cannot bear to look at. The campaigns against the Elamites are among the most vivid of the battle-pieces, when Te-umman, the king who had dared to rebel, was slain with his sons, and the mass of the army perished by the sword, by torture and by drowning. Thus the ancient kingdom of Elam came to an end, and its treasures passed over the mountains to Nineveh.

Among the proud accounts Ashur-bani-pal gives of the successes against the Elamites there is the statement, "With the cut-off head of Te-umman, the road to Arbela I took with joy." On the only slab among the Assyrian sculptures which gives a picture of quiet home life Ashur-bani-pal and his queen are shown feasting in a garden and the cut-off head of Te-umman hangs on a tree just above them.

Ashur-bani-pal passed much of his time, when he was not killing men, in killing animals, and the slabs from his palaces that show him hunting lions, wild asses and goats are in the finest and freest style of Assyrian art. Pain, terror, fury are all pictured in lifelike reality, evidently studied from nature, as the king's arrows and spears carry death in the hunting-grounds.

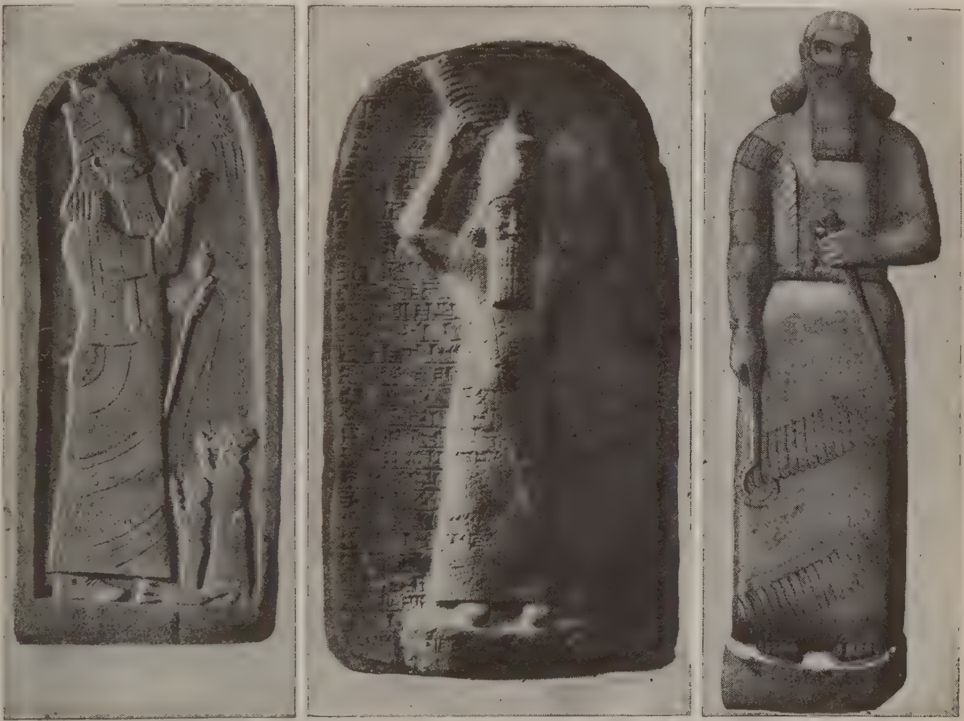
ONE OF THE MOST WONDERFUL LIBRARIES THAT THE WORLD HAS EVER SEEN

But Ashur-bani-pal not only carried on the traditions of his family in warlike prowess and in successful daring in the hunting-field; he was a great book-collector, like his grandfather Sennacherib and his great-grandfather Sargon. Like them, too, he sought for copies of the old Babylonian books in the libraries and temples of the ancient cities, and set scribes to work copying, repairing, translating, arranging and cataloguing, as well as writing new annals. In this way the library in his palace became one of the most extraordinary the world has ever seen.

There are some thousands of these books in the British Museum alone, and many have labels beside them giving an account of their contents. So let us now spend a little while pretending to wander through the library, looking over books new to us, though the hands that wrote them, and the eyes that first read them, have been turned to dust for long centuries.

HOW THE KING OF HOSTS WROTE HIS NAME IN HIS BOOKS

Ashur-bani-pal gave his name and address in his books in rather a lengthy and vainglorious form for a book-plate: "The palace of Ashur-bani-pal, king of hosts, king of Assyria, who putteth his trust in the gods Ashur and Bêlit, and who has eyes which see, and ears which hear. I have written upon tablets the noble products of the work of the scribe, which none of the kings who had gone before me had learned. I have arranged them in classes, I have revised them and placed them in my palace that I, even I, the ruler who knoweth the light of Ashur, the king of the gods, may read them. Whosoever shall carry off this tablet, or write his name upon it side by side with mine own, may Ashur and Bêlit overthrow him in wrath and anger, and may they destroy his name and posterity in the land.”



THREE KINGS OF ASSYRIA, CARVED IN STONE THOUSANDS OF YEARS AGO

On the left is Esarhaddon, the son of the Sennacherib mentioned in the Bible; in the middle, Ashur-bani-pal, his son, perhaps the most powerful and cruel of the Assyrian monarchs; and on the right is Ashur-nazir-pal, who lived about the time of Jeroboam, king of Israel. He was a great conqueror, boaster and builder.

It is the creation tablets in this royal library of Nineveh that arouse the greatest interest. They are believed to be copies of much more ancient ones from the kingdom of Babylonia. The familiar scenes of the opening chapters of the book of Genesis rise before us as we read, in these other old books of beginnings, when the heavens and the earth were not.

Even the words seem familiar as we read of the creation of the planets and stars, and of the moon made to set a limit for the days. Then comes the account of the filling of the earth with beasts and cattle, and birds and creeping things. How well known to us seems the teaching of the god Marduk to the man who is the crowning work of his marvelous creation: “Thy heart shall be pure before thy god, for that is due to him. Thou shalt pray, and shalt make supplications and bow low to the earth early in the morning.”

Of surpassing interest, too, are the tablets bearing what has been called the oldest fairy story in the world, the wanderings and adventures of the great hero Gilgamesh. We catch bewildering glimpses of prowess like that of Hercules, the hero of the Mediterranean, of dazzling experiences like those of Sindbad the Sailor, for Gilgamesh fought unequal battles with monsters, and was helped by a sailor, and saw trees laden with precious stones instead of fruit.

In the course of his wanderings he heard the story of the Flood from the Babylonian Noah—how he built a ship and saved himself and his family and some animals, and how all remaining living creatures were drowned in the storm of rain and wind. He heard, too, of the flight of the dove from the ark, followed by a swallow and a raven, and the reappearance of dry land and the repeopling of the earth.

From these stories we pass on to the grammar books, and those giving lists of signs and their meanings; more than three hundred signs are shown to have been in common use in the tablets, out of nearly six hundred which the Assyrian language then contained. On the tablets ruled in columns we may notice the differences in the two old languages, Sumerian and Akkadian; and other tablets give translations into Assyrian, with all kinds of exercises and examples, and even proverbs and riddles.

The history section of the royal library is very full, for the kings loved not only to record their doings and conquests, but to hunt up ancient inscriptions on cylinders and tablets, and to set forth dates and names of kings, with particulars of their buildings and wars, copied from various old chronicles. As we read we realize the great stretch of centuries that goes back to the old Babylonian times, and we learn of the constant disputes about the boundaries of the two kingdoms of Babylonia and Assyria.

A KING'S LETTERS TO HIS BROTHER 2,500 YEARS AGO

Of the particulars of the building of temples and palaces there is no lack, and the records of Ashur-bani-pal's own history are endless. We can see letters to him from his twin brother, whom he made governor of Babylon. Out of this grew a tragedy, for his brother rebelled; but he failed and perished miserably in the flames of his palace. It was useless to ask pardon of Ashur-bani-pal.

There is, indeed, no end to the variety of interests in the tablets. The study of them takes us into the very heart of life in Assyria during the times of its most powerful kings. For, in addition to all the old legends and the language and history teaching, there are many hymns and prayers to the gods, showing the religious feeling of those far-off days. And there are countless letters on private and business matters disclosing the relations between man and man.

And with these tablets we find others giving directions for making the images of the gods, for their transport, for supplying crowns for their heads and furniture for their idolatrous worship. With regard to the business letters, the sales of slaves, houses, land and crops, the loans and repayments, all show that life was carried on in and around Nineveh under much the same conditions as in the old mother-city of Babylon centuries before.

THE DESOLATION THAT CAME TO THE MIGHTY CITY OF THE GREAT KING

As we pore over this living story of the long-dead past we notice how many of the tablets are cracked and broken, how many show marks of fire. For there came a day—only about thirty years after Ashur-bani-pal's death—when the quiet library was deserted, and scribes and students no longer passed careful hands along the narrow shelves on which the tablets were arranged, with a well-kept system of catalogues and labels, each class of literature by itself.

For the high tide of Assyrian power had begun to turn even before Ashur-bani-pal's death. Weak kings followed him, and the great nation of the Medes on the eastern borders defeated the Assyrians, who up to that time had been unconquerable. The invaders were held off from the capital only by the sudden rush across western Asia of the savage hordes of the Scythians, who destroyed everything that came in their way.

But the end was drawing near. The Medes joined with Nabopolassar, an Assyrian general commanding in Babylonia. Then the city of Nineveh, that great city of palaces and temples and books, was taken and destroyed by fire after a siege of two years. That was how the wooden shelves and fittings of the royal library were burned, and the tablets fell in heaps in the ruins, some of them broken and scorched. This was over 2,500 years ago.

THE DEAD HEART OF A PROUD EMPIRE THAT HAS UTTERLY PERISHED

The destruction of the city meant death or slavery for those who had made their homes in it, and to the empty, desolate ruins came no fresh settlers. Slowly the stone slabs and monuments became covered with mud, as the soft sun-dried bricks turned back to clay and earth, while heavy rains and strong winds did their share in leveling and rounding the mounds and in bringing vegetation to cover the grave of a city once full of life and toil, luxury and poverty.

And not only Nineveh, but one by one, in like manner, the rest of the cities of Assyria were crushed and buried, and in time forgotten. For, after the fall of its capital, the whole northern kingdom which had been independent for over a thousand years, passed under the power of the Medes. Then the tributary states, which had been fought for with such energy and cruelty, all fell apart.

Nabopolassar took Babylonia for his share and founded the new Babylonian Empire, which lasted scarcely a hundred years. Those years are, however, full of events. Nabopolassar's son was Nebuchadnezzar II, already known to us in the story of Daniel's youth. It was this Nebuchadnezzar who took Jerusalem, seized and blinded the king, and completed the carrying into captivity of the Jews. We all know the stories of Daniel and of the three young Hebrews who were thrown into the fiery furnace for refusing to worship the golden image that Nebuchadnezzar set up. Can you imagine the noisy scene on the plain of Dura—the shouting crowds, the jangling sound of the musical instruments, and the intense glow of heat from the great fire?

Nebuchadnezzar ever showed great zeal for the honor of the gods, and one of his most renowned works was that of restoring a very ancient temple to his special god, Nebo. This act touches with light one of the oldest stories of the world, that of the Tower of Babel. We can see in the cases at the British Museum some of the glazed tiles of different colors with which Nebuchadnezzar faced each of the seven stories of his temple.

But even more interesting is his account of the tower of immense height which his building replaced. Its top had been left unfinished by its builders of olden time, so that rains and storms, through the centuries, slowly destroyed the walls and facings, till all sank into a state of ruin. Birs Nimrud, the present name of the mound which covers the ruins of this traditional Tower of Babel, is a few miles away from the dead heart of ancient Babylon. We may read the marvelous story of Nebuchadnezzar's buildings and undertakings in this great city, larger, it is said, than London or New York is now. It is all told in the bricks stamped with his name, in the inscriptions on slabs, in cylinders and bronze doorsteps.

THE HANGING GARDENS OF BABYLON, ONE OF THE WONDERS OF THE WORLD

This was the greatest marvel in a place of marvels which Nebuchadnezzar called "the admiration of mankind." The gardens were laid out on terraces reared upon a series of mighty arches, and are said to have been built by Nebuchadnezzar for his favorite wife, who came to the flat plain of Babylon from a hilly land.

It is not difficult to understand the intense pride of Nebuchadnezzar, walking about his palaces and temples and gardens, and saying: "Is not this great Babylon, that I have built for the house of my kingdom, by the might of my power, and for the honor of my majesty?" Alas! for the sudden and awful madness that overtook him when he believed that he was no longer a man but a beast of the field.

Daniel, though one of the captive race, had risen to high authority in the state, owing to his uprightness and ability. Now, during the king's illness he acted as regent, and he also lived on through the reign of Nabonidus, who followed Nebuchadnezzar.

From the tablets of these reigns, giving particulars of shepherds and gardeners, sales and transfers of land, the making of canals and the care of the embankments, we can see that the prosperous agricultural and trading life went on in the new Babylonian Empire as it had done in the old.

Of the many interesting links between the old and new empires we mention two. In one of the cases in the British Museum there is a weight with an inscription stating that it is an exact copy of one made by Nebuchadnezzar (king of Babylon from 604 to 561 before Christ) and that his in turn was made after the standard fixed by Dungi, king of Babylon just 2,500 years before. And Nabonidus was delighted to discover monuments of Burna-buriash, one of the writers who made the Tel-el-Amarna tablets a thousand years before his day; and those of Hammurabi, the great lawgiver and canal-builder, who lived nearly a thousand years before Burna-buriash; and those of Sargon I, a thousand years earlier than the great king Hammurabi.

Nabonidus had a son who was called Belshazzar. The very mention of his name rouses us, for who has not heard of the great feast that he gave to a thousand guests, and of how wine was drunk out of the sacred vessels that had been taken from Jehovah's temple in Jerusalem? The loud revelry at its height was suddenly frozen into stillness by the sight of writing mysteriously thrown upon the palace wall. It was only the names of the common weights of the Babylonian market—like our pounds and ounces. What could it mean? Daniel was called in to explain it to Belshazzar and his terrified guests. Meanwhile, what was happening outside the immense walls, strong enough, it would seem, to keep any enemies out?

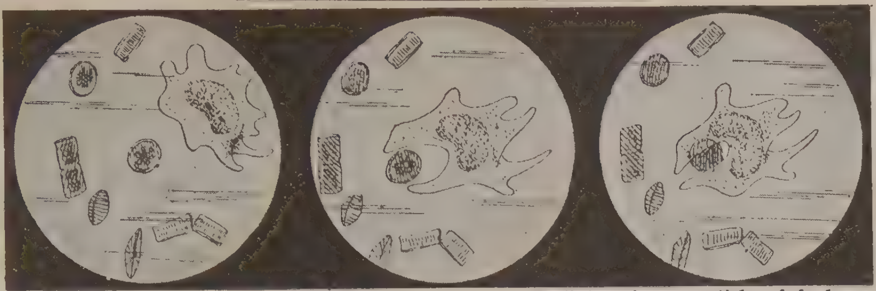
Enemies had been slowly closing in—men who have been described as hardy warriors, riding well, speaking the truth, drinking water, not wine, while the careless feasted. These Persians, closely allied to the Medes, had been silently turning aside the course of the river which ran through the city, so that when the moment came they could pass in over its dried-up bed.

The writing interpreted by Daniel read as follows: "God hath numbered thy kingdom, and finished it. Thou art weighed in the balances, and art found wanting. Thy kingdom is divided, and given to the Medes and Persians."

These prophetic words were fulfilled that very night. Belshazzar was killed; but, as we learn from the cylinders, the Persians entered Babylon without fighting, and the fine city was spared.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 807.

This mound, known as Birs Nimrud, is all that remains of the once-mighty city of Borsippa, the sister city of Babylon, from which it stood about ten miles. We can see the remains of a great tower that Nebuchadnezzar built in honor of his god Nebo on what was supposed to be the site of the Tower of Babel.



These pictures show an ameba throwing out two "arms" to seize a particle of food. The arms gradually surround the particle and draw it into the substance of the ameba.

THE VERY SEAT OF LIFE

CONTINUED FROM 559

EVERY creature that exists—a moss, or a man, or a microbe, or a monkey, or a fish—is made of living cells.

We are all alike in this, all living things; but if we survey the whole world of life in this fashion, we find that a very great division can be made. In the one division are creatures made simply of one cell, and in the other are those made of more than one cell. The one-celled creatures were the first to appear on the earth, and we have learned a good deal about them. We need the microscope to see them.

The many-celled creatures are all the visible world of life, animal and vegetable. There is a vast difference between, shall we say, an oak tree and a microbe. The first is made of billions of cells, and the other is made of only one; yet we find that the living cells in each are astonishingly similar. The single cell of a microbe, a cell in the leaf of an oak tree and one in the skin of your hand are all much alike. If we could learn the secret of the cell, we should have the secret of life; and the first great lesson we have to learn is the lesson of oneness in different things.

Already we have studied a number of cells closely resembling one another, which we call microbes. Wherever we turn in the world of life we find cells and yet more cells. Having looked at the cells which form the bodies of the simplest plants, we may now look at the simplest kind of animal. The cell which makes it is what we call a typical cell—that is to say, it has all the characters of cells in general.

This humblest of animals is called the ameba, and is readily found in ponds; it simply consists of a single cell which has no cell-wall. If we watch it under the microscope, we shall see a very good reason why it should not have a cell-wall. The ameba is just a round speck of living matter, but it can move of itself, as we say. You know already that movement is usually a mark of living things, and this ameba, like most cells, can move itself about. It does this by crawling. It swells out one side of its body and then pulls the rest of its body after it.

Of course, if the ameba had a stiff wall round it, it could not crawl; to crawl it is bound to change its shape. So, though we call it round, when the ameba is active and looking for something to eat it is not round, but has an irregular shape which changes from moment to moment. It is round only when it is starved and almost dead, or perhaps when it has had plenty of food and is resting after a meal.

We now know that there is a very simple way of making an ameba stop moving and become quite round. This is very interesting because it teaches us that life is the same everywhere.

You have heard of chloroform. This is a liquid looking rather like water, but with a curious smell. It is given to people to smell when perhaps they have had a finger crushed and the tip of it has to be taken off. It sends them to sleep in a peculiar way, so that they feel no pain. This is because the chloroform acts on the cells of their brain and makes them stop working; but in most respects cells are really the same, and true poisons, like alcohol, chloroform, prussic acid and so on, act on all cells alike.

WHAT HAPPENS TO LIFE WHEN WE GIVE IT CHLOROFORM

So, if you are watching an ameba crawling under the microscope and add the very tiniest amount of chloroform to the water in which it is moving, it is poisoned; it stops moving and curls itself up into a round ball.

Of course, if you give too much chloroform, the ameba will be killed, just as a man would be killed if you gave him too much chloroform. But do you not think it is very interesting that the same stuff should act in the same way on every kind of living cell? We are not to imagine that the cells in our brain look like the ameba, or that they crawl about; they have a very different business. Nevertheless, they are alive, and the point is that all living cells everywhere, whatever their business is, have their life arrested if they are chloroformed. In reality all life is one and the same.

THE MOST REAL PART OF THE CELL WHICH IS THE ABODE OF LIFE

Now let us look more closely at the ameba and see whether we can find different parts in it. Is it just a round speck with no features; or has it different parts, just as our bodies have different parts? The answer to this is that the ameba has two parts, and that this is the general rule with living cells.

Somewhere about the centre of the ameba, this tiny speck, there is a still tinier speck, which is not an accident but is found in all amebas. It looks a little denser than the rest of the ameba, probably because it has not quite so much water in it. It has a special and very important name—important because the little speck of living stuff is typical of the living cell everywhere.

It is called the nucleus, which is from the Latin word for a nut, which is *nux*, and means simply the "kernel." This is a very good name, for the kernel of a nut is the real part of it; the rest exists for the sake of the kernel. And, just as the cell-wall is not the real cell, so the outer part of the cell itself is not the real cell. The real part of the cell, as we shall soon see, is the nucleus, which is the very abode of life. But we may, first of all, say a word or two as to the rest of the cell, though it is of far less importance.

In the case of the ameba and many other cells the outside part of the cell is something like our bodies as compared with our brains. The cell moves by the movements of the outer part.

So we may say that it serves the cell for legs. Then, of course, the ameba has to take in its oxygen through the outer part of the cell, which thus serves it for nose and lungs. Remember that every living cell in our own bodies is also breathing in the same way.

THE NUCLEUS IS REALLY THE MASTER OF THE CELL

Like every other living creature, the ameba has to feed. No living thing can make its life and movement out of nothing. The ameba has no hands, no mouth, and certainly no knife and fork; but it has to get food into its body somehow, just as we have to. When it meets a tiny speck of something it can eat, it slowly throws out from itself two little projections, one on each side of the speck of food. These gradually inwrap or flow round it, until at last it is inclosed inside the body of the ameba—that is to say, inside the cell.

The pictures show us exactly what the ameba looks like when it is taking a meal, and how it makes arms and mouth for itself. Just as we have to digest our food, the ameba has to digest its food; and so the outer part of the ameba, or, rather, the whole ameba except for the speck in its centre, may play the part of a stomach. Whatever the ameba eats has to be digested outside the nucleus. You never find a speck of food inside the nucleus, any more than you would find a trace of milk inside the human brain.

All the work of digestion and preparing has to be done outside the nucleus. The nucleus is the master, and all the work has to be done outside it and for it, so to speak; just as in our own bodies the brain is the master.

When we come to look at the white cells of our own blood, we see that they are able to pick up and carry away particles of smoke that we have breathed into our lungs. They are even able to catch and kill microbes and other living cells which might hurt us. But you will never find a speck of coal-dust or a microbe inside the nucleus of a white blood-cell, unless the cell has been killed by the microbe and is falling to pieces.

THE NUCLEUS OF THE CELL ON WHICH THE LIFE DEPENDS

If we look at the cell apart from the nucleus, we are very uncertain as to how it is made. It is certainly not transparent, though it lets a good deal of light through it; it looks rather like a half-transparent jelly. Indeed, if you can imagine a jelly looking like ground glass, that would be very much what the body of a cell looks like.

Not only is the nucleus the essential part of the cell, but the life of the body of the cell depends upon the nucleus. If one of your fingers were cut off, it would die; your finger is alive, but it cannot live by itself. In the same way, if we cut off any part of the body of a cell from the rest of the cell, it will die; or, to put it another way, if you cut a cell into two parts, one of them containing the nucleus and the other not, then the part which contains the nucleus will go on living, will mend itself, will recover its former shape. But the part which does not contain the nucleus will die. This always happens; no exception to it is known anywhere. It is true of the ameba, but if we take the case of a cell more unlike the ameba than anything else we know, we find that the same is true.

THE LIKENESS BETWEEN THE AMEBA'S LAWS OF LIFE AND YOURS

The nerve-cells in our bodies are at first very much like the ameba, but when they are fully formed, they are vastly different. Like the ameba, they have a nucleus. But the cell-body is prolonged in one or more directions in the form of a long thread, which is what we call a nerve. That thread is really part of the cell-body of the nerve-cell from which it springs. So if you were to cut a nerve across, the experiment would really be the same as the experiment of cutting the ameba into two pieces, one containing the nucleus and the other not; and the result is the same in both these different cases.

The part of the nerve still in connection with the nucleus remains alive and unchanged. The other part of the nerve, on the far side from where the cut was made, dies. It seems to me very wonderful indeed that such a cell as this tiny ameba of the ponds, on the one hand, and one of the nerve-cells in the human brain, on the other hand, are so much alike. In spite of the measureless difference between these two cells, the laws of their lives are one and the same.

The laws of any life are the laws of all life, however vast the difference may be between one kind of living creature and another. After an accident where a nerve has been cut, a clever surgeon may sew the two cut ends of the nerve together. Through the power of the nucleus, which may be two or three feet away, as in the case of the nerves of our legs, new living nerve-matter will grow down from the cut place into the sheath of the old nerve. In the same manner the piece of the ameba that contained the nucleus soon grows into a whole ameba once more.

PROTOPLASM, THE WONDERFUL MATTER IN WHICH ALL LIFE LIVES

The nucleus, then, is the centre of the life of the cell; apart from the nucleus the body of the cell cannot live. The cell's power of repairing damage depends entirely upon the nucleus.

Furthermore, we have learned lately that the character of the cell depends upon the nucleus. Boys and girls differ in character, as we know; though their bodies are very much alike, their brains are different. Probably all cell-bodies are made of very much the same stuff, arranged, if it is arranged at all, in very much the same way; but it is the nucleus of one kind of cell that differs from that of another, and so gives the cell its character.

Though the body of a cell cannot live without its nucleus, yet the body of the cell is truly alive, and will live, for a very short time, even when separated from the nucleus. The stuff, then, of which the body of the cell is made, and the stuff of which the nucleus is made, is living stuff. As we are beginning to understand that all life is really the same, we shall not find it difficult to believe that all living matter, wherever it is found, whether in a lily or in a fish or in a man, has certain properties which make it different from matter that is not alive. This is certainly so, and we must clearly understand the wonderful stuff which we may call living matter, or, at any rate, matter in which life exists. The name for this particular kind of matter in which all life lives is *protoplasm*. The word really means the "first building-stuff." All the life we know is lived in protoplasm. The living part of all living cells is made of protoplasm, both the cell-body and the nucleus.

THE THINGS THAT MAKE UP WHAT WE CALL PROTOPLASM

Now, all matter is made up of various kinds of elements, such as carbon, silver, oxygen and so on; and the first thing we have to ask about protoplasm is, What elements does it contain? The answer to this is certain. Protoplasm is made up, *somehow*, of certain elements which we are perfectly familiar with in the world in general. Nor are they even rare elements. They are among the commonest and most widespread of all the elements that we know. This is a very important fact. Even the most wonderful kind of living cells there are—the nerve-cells of the highest part of the human brain—are made up, so far as their elements are concerned, of the stuff that is all around us.

We must notice exactly what the elements found in protoplasm are. Two of them, at any rate, we know already, for we know that all protoplasm contains water, which is made of the elements oxygen and hydrogen. It would be more correct to say that protoplasm is contained in water, rather than that protoplasm contains water. Live things cannot live without liquid water.

THE FIVE GREAT ELEMENTS THAT ARE NECESSARY TO ALL LIFE

We have lately learned, however, that this statement is not quite the whole truth. It must not be taken to mean, for instance, that if a living thing is frozen, or if it is made quite dry, it must always die. That is not so. In these cases the living creature stops living *always*, but it does not necessarily die; it stops growing, it stops breathing; it shows none of the characters of life, which are shown only in the presence of liquid water.

Yet, though it cannot be said that it is living, it may have in it the power to live if it gets liquid water; it cannot be called living, and it cannot be called dead. At any rate, we understand that the processes of life do not go on except in the presence of liquid water. It is probably right to say that liquid water is one of the things that make protoplasm. The quantity of water present is not always the same. It varies from about ten per cent to about ninety.

Besides the oxygen and the hydrogen of the water, in which all protoplasm lives, there is a great deal more of both oxygen and hydrogen in it; not combined together, however, to form water, but combined in different ways with various other elements, and with each other. The elements always found in protoplasm, without which protoplasm cannot exist, are carbon, oxygen, hydrogen, nitrogen and phosphorus. We cannot be perfectly certain whether sulphur is necessary for protoplasm; but there can be no protoplasm without the five elements we have named. They are all common elements, and there is nothing rare about any of them. Living protoplasm could not be spread through the world if the things it needs for its life and for remaking itself as it goes on living were not to be found almost everywhere. Life, then, is made out of common things.

THE GREAT POWER OF PROTOPLASM TO MAKE NEW THINGS OUT OF OLD

Now, if we have got that clearly understood and remembered, we can go on to another great fact which must always be remembered along with it. While, on the one hand, the elements of protoplasm are common and familiar, the ways in which they are combined in protoplasm are unlike anything else in the world.

You remember that what we call the elements often combine with one another to form what we call compounds. The simplest instance is the compound water made by a combination of the elements oxygen and hydrogen; and water is found in protoplasm. But the compounds of which protoplasm is made, though they are compounds of familiar elements, are different from compounds found anywhere else. This, then, is the power of protoplasm: to take common, ordinary things and make them into things which are new and different. Poets do this with common words; great composers of music do it with sounds that are at anyone's disposal; life does it with the common elements of the world, building them into protoplasm. Out of this are built the bodies of all the varied and beautiful living creatures that live and have lived and are yet to live.

THE NEXT STORY OF OUR OWN LIFE IS ON PAGE 803.

THE GREATEST STORY OF ADVENTURE

WHEN we read the Iliad and the Odyssey, The Faerie Queene and Don Quixote, we all know that such adventures as those books describe will not fall to us. But in the early part of the eighteenth century an Englishman wrote a story of marvelous adventure that for a long time was regarded as a true narrative. The writer was Daniel Defoe, and his story Robinson Crusoe. It is a great work of the imagination, although the real adventures of a shipwrecked sailor named Alexander Selkirk may have suggested the idea of Robinson Crusoe to Defoe. The story has been translated into many foreign languages. It is on account of Robinson Crusoe that Daniel Defoe is called the "Father of English Fiction."

ROBINSON CRUSOE

CONTINUED FROM 278

AT the beginning of his story Robinson Crusoe tells us that he was born in York in 1632, the third son of a good family. His father intended him for the law, but he would be satisfied with nothing but going to sea. His father, a wise and grave man, gave him serious and excellent counsel, telling him that it was men of desperate fortunes, on the one hand, or of aspiring, superior fortunes, on the other, who went abroad upon adventures. But young Robinson soon forgot the advice of his father. On September 1, 1651, he boarded a ship bound from Hull to London.

This vessel was wrecked, but the men made their way to shore in a boat sent from a lightship. They landed near Cromer, and walked to Yarmouth. There they had money given them to carry them to Hull or London, as they thought fit. Without heeding the warning of the master of the wrecked vessel, who bemoaned the fact that he had taken one so like Jonah in his ship, Robinson Crusoe hardened his heart against going back. He went on to London, where he took passage as a gentleman adventurer on board a vessel bound for the coast of Africa. The captain, taking a fancy to him, instructed him what to buy for trading purposes, and on the voyage taught him much about navigation.

This voyage was most successful. He brought home 5 pounds 9 ounces of gold-dust. This he sold in London for £300 ($1,500). Investing $500 of his newly gained wealth in another adventure, Robinson Crusoe once more set out on the same ship, which was this time captained by its former mate. One morning when they were making their course toward the Canary Islands they were surprised by a Moorish rover of Sallee. After a severe fight all were carried prisoners into that port.

While the other men were carried up-country to the emperor's court, Robinson Crusoe was kept as a prize by the pirate captain, and made his slave.

When his new master went to sea, Robinson was left on shore to look after the garden. At other times the Moor took his white slave out fishing in the pinnace. Soon Crusoe became such a skillful fisherman that he was sent out alone or with a young Moor as his sole companion. When he had been two years a prisoner, an opportunity for escape presented itself. With Xury, a young black boy, he departed from Sallee in the long boat.

After many adventures the pair were picked up near Cape de Verde by a Portuguese ship bound for the Brazils. The captain proved very friendly and bought from Crusoe the long boat and the boy Xury.

Arriving in Brazil, Crusoe entered into partnership with a sugar planter. He wrote to England and asked that goods to half the value of the money he had left there be sent out to him. Selling these goods at a large profit, he started a tobacco plantation. But at the end of four years he became restless. So he spoke to his fellow-planters about his early voyage to Africa.

He told them tales of exchanging trifles for ivory, gold-dust and slaves. One day three of the planters proposed that they should provide a ship if Crusoe would go with them to do the trading. Robinson Crusoe gladly agreed.

When the ship in which Crusoe and his companions sailed from the Brazils had been about twelve days out, it was caught in a violent hurricane, and they were taken quite out of their reckoning. One of the men died of fever, and a man and a boy were washed overboard.

It was resolved to make for the West Indies, the vessel being in a very battered condition. But they were taken by another great tornado, and for twelve days together they could do nothing but drive before the wind. Finally the ship struck on a sand bank. The men took to the boat, which was overturned at once by a gigantic wave. Robinson Crusoe was tossed senseless on the shore. When he recovered he found himself alone on an island. That night he spent in a tree for fear of prowling animals.

When Crusoe awoke from his sleep in the tree, he saw that the wrecked ship had been lifted from the sand bank and carried much farther inland. At the ebbing of the tide he was able to get within a quarter of a mile of her. So, hoping to get some things from her that would be useful, he swam out, and by the help of a piece of hanging rope managed to clamber on board. A dog and two cats were the only living creatures left on board, and these became his companions.

HOW THE PROVISIONS AND CARGO WERE REMOVED FROM THE WRECK

There being no time to lose, he filled his pocket with biscuits, which he ate as he went about, and he made a raft. On this he fastened some seamen's chests. He filled these with provisions, tools and ammunition, and then got his raft ashore.

For eleven days he kept returning to the vessel, and so brought away pretty well all that was on board. The next morning, when he left the hut he had made for himself on the shore, he looked out to sea. Behold, the ship was gone!

On a rising hill of rock, so that if any ship came in view he might be able to signal to her, he resolved to fix up a tent of sails.

In front of where his tent was to be he drew a semicircle some twenty yards in diameter and touching the rock at both ends. Along the edge of this semicircle he planted two rows of strong stakes, one six inches behind the other, driving them into the ground till they stood about five and a half feet above ground.

THE INGENIOUS DEFENSES OF CRUSOE'S ISLAND HOME

He sharpened the tops of the stakes, and filled the gap between them with cable from the ship. Then he placed other stakes inside, leaning against the others, about two and a half feet high, like a spur to a post. He thus had a fence so strong that neither man nor beast could get over it. He left no door, but made a short ladder which, when he was in, he lifted over after him.

Into this fence, or fortress, he carried all his riches, provisions and stores. Having fixed up a tent, he covered the whole with a large tarpaulin which he had saved among the sails.

In order that he might not lose his reckoning of time, he cut the following words on a large post: "I came on shore here on September 30, 1659." Making a kind of cross, he set this up on the shore. On the sides of the post every day he cut a notch, making every seventh notch as long again as the rest, to mark the Sundays.

HOW CRUSOE WAITED FOUR YEARS TO GET SOME BREAD

Meanwhile he discovered that there were goats, rabbits and wild cats on the island, as well as wild birds. Of every creature he shot he preserved the skin.

When his fortress was completed, he made some chairs and a table. For every board he wanted, he had to cut down a tree, hew it thin with an ax, and smooth it with an adz. After a storm parts of the old wreck were washed ashore, and he was thus provided with planks and bolts.

One day, just before the rainy season, he emptied what appeared to be a quantity of husks and dust from an old barley-bag on to the ground. After the rains he saw a few stalks of something green shooting up. Later a number of ears of barley and rice came out. He saved these ears and sowed them. But it was not until he had been four years on the island that he ventured to use any of the grains to make bread.

Here, in Defoe's words, is an account of Crusoe's island life, dress and a terrible fright he received when he had become accustomed to solitude and safety.

THE MYSTERIOUS FOOTPRINT IN THE SAND

BUT being now in the eleventh year of my residence and, as I have said, my ammunition growing low, I set myself to study some art to trap and snare the goats, to see whether I could not catch some of them alive; and particularly I wanted a she-goat great with young. To this purpose I made snares to hamper them; and believe they were more than once taken in them; but my tackle was not good, for I had no wire, and always found them broken, and my bait devoured. At length I resolved to try a pit-fall; so I dug several large pits in the earth, in places where I had observed the goats used to feed, and over these pits I placed hurdles of my own making too, with a great weight upon them; and several times I put ears of barley, and dry rice, without setting the trap; and I could easily perceive that the goats had gone in, and eaten up the corn, for I could see the marks of their feet; at length, I set three traps in one night, and going the next morning, I found them all standing, and yet the bait eaten and gone. This was very discouraging; however, I altered my trap; and, not to trouble you with particulars, going one morning to see my traps, I found in one of them a large old he-goat; and, in one of the others, three kids, a male and two females.

As to the old one, I knew not what to do with him; he was so fierce I durst not go into the pit to him; that is to say, to bring him away alive, which was what I wanted; I could have killed him, but that was not my business, nor would it answer my end; so I e'en let him out, and he ran away as if he had been frightened out of his wits; but I did not then know what I afterwards learned, that hunger would tame a lion: if I had let him stay there three or four days without food, and then have carried him some water to drink, and then a little corn, he would have been as tame as one of the kids; for they are mighty sagacious, tractable creatures, where they are well used.

However, for the present I let him go, knowing no better at that time; then I went to the three kids, and taking them one by one, I tied them with strings together; and with some difficulty brought them all home.

It was a good while before they would feed; but throwing them some sweet corn, it tempted them, and they began to be tame; and now I found that if I expected to supply myself with goat's flesh, when I had no powder or shot left, breeding some up tame was my only way, when perhaps I might have them about my house like a flock of sheep. But then it presently occurred to me that I must keep the tame from the wild, or else they would always run wild when they grew up; and the only way for this was to have some inclosed piece of ground, well fenced either with hedge or pale, to keep them in so effectually that those within might not break out, or those without break in.

This was a great undertaking for one pair of hands; yet as I saw there was an absolute necessity of doing it, my first piece of work was to find out a proper piece of ground; namely, where there was likely to be herbage for them to eat, water for them to drink, and cover to keep them from the sun.

Those who understand such inclosures, will think I had very little contrivance, when I pitched upon a place very proper for all these, being a plain open piece of meadow-land, or savanna (as our people call it in the western colonies), which had two or three little rills of fresh water in it, and at one end was very woody; I say they will smile at my forecast, when I shall tell them I began my inclosing of this piece of ground in such a manner, that my hedge, or pale, must have been at least two miles about; nor was the madness of it so great as to the compass; for if it was ten miles about, I was like to have time enough to do it in; but I did not consider that my goats would be as wild in so much compass, as if they had had the whole island; and I should have so much room to chase them in that I should never catch them.

My hedge was begun and carried on, I believe, about fifty yards, when this thought occurred to me; so I presently stopped short, and for the first beginning I resolved to inclose a piece of about 150 yards in length, and 100 yards in breadth, which, as it would maintain as many as I should have in any reasonable time, so, as my flock increased, I could add more ground to my inclosure.

This was acting with some prudence, and I went to work with courage. I was about three months hedging in the first piece; and till I had done it, I tethered the three kids in the best part of it, and used them to feed as near me as possible, to make them familiar; and very often I would go and carry them some ears of barley, or a handful of rice, and feed them out of my hand; so that after my inclosure was finished, and I let them loose, they would follow me up and down, bleating after me for a handful of corn.

This answered my end, and in about a year and a half I had a flock of about twelve goats, kids and all; and in two years more I had three-and-forty, besides several I took and killed for my food; and after that I inclosed five several pieces of ground to feed them in, with little pens to drive them into, to take them as I wanted them; and gates out of one piece of ground into another.

But this was not all; for now I not only had goat's flesh to feed on when I pleased, but milk, too, a thing which indeed in my beginning I did not so much as think of and which, when it came into my thoughts, was really an agreeable surprise; for now I set up my dairy, and had sometimes a gallon or two of milk in a day. And as Nature, who gives supplies of food to every creature, dictates even naturally how to make use of it, so I, that had never milked a cow, much less a goat, or seen butter or cheese made, very readily and handily, though after a great many essays and miscarriages, made me both butter and cheese at last, and never wanted it afterwards.

How mercifully can our great Creator treat his creatures, even in those conditions in which they seemed to be overwhelmed in destruction! How can he sweeten the bitterest providences, and give us cause to praise him for dungeons and prisons! What a table was here spread for me in a wilderness, where I saw nothing at first but to perish for hunger!

It would have made a stoic smile, to have seen me and my little family sit down to dinner: there was my majesty, the prince and lord of the whole island; I had the lives of all my subjects at absolute command; I could hang, draw, give liberty, and take it away, and no rebels among all my subjects!

Then to see how like a king I dined, too, all alone, attended by my servants! Poll, as if he had been my favorite, was the only person permitted to talk to me; my dog, which was now grown old and crazy, and found no species to multiply his kind upon, sat always at my right hand; and two cats, one on one side the table, and one on the other, expecting now and then a bit from my hand as a mark of special favor.

But these were not the two cats which I brought on shore at first, for they were both of them dead, and had been interred near my habitation by my own hands; but one of them having multiplied by I know not what kind of creature, these were two which I preserved tame, whereas the rest ran wild into the woods, and became indeed troublesome to me at last; for they would often come into my house, and plunder me too, till at last I was obliged to shoot them, and did kill a great many. At length they left me with this attendance, and in this plentiful manner I lived; neither could I be said to want anything but society, and of that, in some time after this, I was like to have too much.

I was something impatient, as I have observed, to have the use of my boat, though very loth to run any more hazard: and therefore sometimes I sat contriving ways to get her about the island, and at other times I sat myself down contented enough without her. But I had a strange uneasiness in my mind to go down to the point of the island, where, as I have said, in my last ramble, I went up the hill to see how the shore lay and how the current set, that I might see what I had to do: this inclination increased upon me every day; and at length I resolved to travel thither by land, and following the edge of the shore, I did so: but had any one in England been to meet such a man as I was, it must either have frighted them or raised a great deal of laughter; and, as I frequently stood still to look at myself, I could not but smile at the notion of my traveling through Yorkshire with such an equipage, and in such a dress. I had a great high shapeless cap, made of goat's-skin, with a flap hanging down behind, as well to keep the sun from me, as to shoot the rain off from running into my neck; nothing being so hurtful in these climates as the rain upon the flesh under the clothes. I had a short jacket of goat's-skin, the skirts coming down to about the middle of my thighs, and a pair of open-kneed breeches of the same; the breeches were made of the skin of an old he-goat, whose hair hung down such a length on either side, that, like pantaloons, it reached to the middle of my legs. Stockings and shoes I had none, but I made me a pair of something, I scarce know what to call them, like buskins, to flap over my legs, and lace on either side like spatterdashes; but of a most barbarous shape, as indeed were all the rest of my clothes.

I had on a broad belt of goat's-skin dried, which I drew together with two thongs of the same, instead of buckles; and in a kind of frog on either side of this, instead of a sword and dagger, hung a little saw and hatchet; one on one side, one on the other: I had another belt not so broad, and fastened in the same manner, which hung over my shoulder; and at the end of it, under my left arm, hung two pouches, both made of goat's-skin too; in one of which hung my powder, in the other my shot: at my back I carried my basket, on my shoulder my gun, and over my head a great clumsy ugly goat's-skin umbrella, but which, after all, was the most necessary thing I had about me, next to my gun: as for my face, the color of it was really not so Mulatto-like as one might expect from a man not at all careful of it, and living within nine or ten degrees of the equinox. My beard I had once suffered to grow till it was about a quarter of a yard long, but as I had both scissors and razors sufficient, I had cut it pretty short, except what grew on my upper lip, which I had trimmed into a large pair of Mahometan whiskers, such as I had seen worn by some Turks whom I saw at Sallee: for the Moors did not wear such though the Turks did. Of these mustachios, or whiskers, I will not say they were long enough to hang my hat upon them; but they were of length and shape monstrous enough, and such as in England would have passed for frightful.

But all this is by-the-by; for, as to my figure, I had so few to observe me that it was no manner of consequence, so I say no more to that part: in this kind of figure I went my new journey, and was out five or six days. I travelled first along the sea-shore, directly to the place where I first brought my boat to an anchor to get up upon the rocks, and having no boat now to take care of, I went over the land a nearer way to the same height that I was upon before; when looking forward to the point of the rock I was obliged to double with my boat, as I said above, I was surprised to see the sea all smooth and quiet; no rippling, no motion, no current, any more there than in other places.

I was at a strange loss to understand this, and resolved to spend some time in the observing of it, to see if nothing from the sets of the tide had occasioned it; but I was presently convinced how it was; namely, that the tide of ebb setting from the west, and joining with a current of waters from some great river on the shore, must be the occasion of this current; and that, accordingly as the wind blew more forcibly from the west, or from the north, this current came nearer or went farther from the shore; for, waiting thereabouts till evening, I went up to the rock again, and then the tide of ebb being made, I plainly saw the current again as before, only that it ran farther off, being near half a league from the shore: whereas in my case it set close upon the shore, and hurried me and my canoe along with it, which at another time it would not have done.

This observation convinced me that I had nothing to do but to observe the ebbing and the flowing of the tide, and I might very easily bring my boat about the island again. But when I began to think about putting it in practice I had such terror upon my spirits at the remembrance of the danger I had been in, that I could not think of it again with any patience; but, on the contrary, I took up another resolution, which was more safe, though more laborious; and this was, that I would build, or rather make me another periagua, or canoe, and so have one for one side of the island, and one for the other.

You are to understand that now I had, as I may call it, two plantations in the island; one, my little fortification or tent, with the wall about it under the rock, with the cave behind me, which by this time I had enlarged into several apartments or caves, one within another. One of these, which was the driest and largest, and had a door yet beyond my wall or fortification, that is to say, beyond where my wall joined to the rock, was all filled up with large earthen pots, of which I have given an account, and with fourteen or fifteen great baskets, which would hold five or six bushels each, where I laid up my stores of provision, especially my corn, some in the ear cut off short from the straw, and the other rubbed out with my hands.

As for my wall, made as before, with long stakes or piles, those piles grew all like trees, and were by this time grown so big, and spread so very much, that there was not the least appearance, to any one's view, of any habitation behind them.

Near this dwelling of mine, but a little farther within the land, and upon lower ground, lay my two pieces of corn-ground, which I kept duly cultivated and sowed, and which duly yielded me their harvest in its season; and whenever I had occasion for more corn, I had more land adjoining as fit as that.

Besides this, I had my country-seat, and I had now a tolerable plantation there also; for, first, I had my little bower, as I called it, which I kept in repair; that is to say, I kept the hedge which circled it in constantly fitted up to its usual height, the ladder standing always in the inside: I kept the trees, which at first were no more than my stakes, but were now grown very firm and tall,—I kept them always so cut, that they might spread and grow thick and wild, and make the more agreeable shade, which they did effectually to my mind. In the middle of this I had my tent always standing, being a piece of sail spread over poles set up for that purpose, and which never wanted any repair or renewing; and under this I had made me a squab or couch, with the skins of the creatures I had killed, and with other soft things, and a blanket laid on them, such as belonged to our sea-bedding, which I had saved, and a great watch-coat to cover me; and here, whenever I had occasion to be absent from my chief seat, I took up my country habitation.

Adjoining to this I had my inclosures for my cattle, that is to say, my goats; and as I had taken an inconceivable deal of pains to fence and inclose this ground, I was so uneasy to see it kept entire, lest the goats should break through, that I never left off, till with infinite labor I had stuck the outside of the hedge so full of small stakes, and so near to one another, that it was rather a pale than a hedge, and there was scarce room to put a hand through between them, which afterwards, when those stakes grew, as they all did in the next rainy season, made the inclosure strong like a wall, indeed stronger than any wall.

This will testify for me that I was not idle, and that I spared no pains to bring to pass whatever appeared necessary for my comfortable support; for I considered the keeping up a breed of tame creatures thus at my hand would be a living magazine of flesh, milk, butter, and cheese for me, as long as I lived in the place, if it were to be forty years; and that keeping them in my reach depended entirely upon my perfecting my inclosures to such a degree that I might be sure of keeping them together; which, by this method, indeed, I so effectually secured that, when these little stakes began to grow, I had planted them so very thick I was forced to pull some of them up again.

In this place also I had my grapes growing, which I principally depended on for my winter store of raisins, and which I never failed to preserve very carefully as the best and most agreeable dainty of my whole diet; and indeed they were not only agreeable, but physical, wholesome, nourishing, and refreshing to the last degree.

As this was also about half way between my other habitation and the place where I had laid up my boat, I generally stayed and lay here in my way thither; for I used frequently to visit my boat, and I kept all things about or belonging to her in very good order. Sometimes I went out in her to divert myself, but no more hazardous voyages would I go, nor scarce ever above a stone's cast or two from the shore, I was so apprehensive of being hurried out of my knowledge again by the currents, or winds, or any other accident. But now I come to a new scene of my life.

It happened one day about noon, going towards my boat, I was exceedingly surprised with the print of a man's naked foot on the shore, which was very plain to be seen in the sand. I stood like one thunderstruck, or as if I had seen an apparition. I listened, I looked round me; I could hear nothing, nor see anything; I went up to a rising ground to look farther. I went up the shore, and down the shore, but it was all one; I could see no other impression but that one. I went to it again, to see if there were any more, and to observe if it might not be my fancy, but there was no room for that, for there was exactly the very print of a foot, toes, heel, and every part of a foot: how it came thither I knew not, nor could in the least imagine. But after innumerable fluttering thoughts, like a man perfectly confused, and out of myself, I came home to my fortification, not feeling, as we say, the ground I went on, but terrified to the last degree, looking behind me at every two or three steps, mistaking every bush and tree, and fancying every stump at a distance to be a man. Nor is it possible to describe how many various shapes an affrighted imagination represented things to me in; how many wild ideas were formed every moment in my fancy, and what strange unaccountable whimsies came into my thoughts by the way.

When I came to my castle, for so I think I called it ever after this, I fled into it like one pursued; whether I went over by the ladder, as first contrived, or went in at the hole in the rock, which I called a door, I cannot remember; no, nor could I remember the next morning; for never frighted hare fled to cover, or fox to earth, with more terror of mind than I to this retreat.

I had no sleep that night; the farther I was from the occasion of my fright the greater my apprehensions were; which is something contrary to the nature of such things, and especially to the usual practice of all creatures in fear. But I was so embarrassed with my own frightful ideas of the thing, that I formed nothing but dismal imaginations to myself, even though I was now a great way off it.

At last I concluded that it must be some more dangerous creature; namely, that it must be some of the savages of the main-land over against me, who had wandered out to sea in their canoes, and, either driven by the currents or by contrary winds, had made the island, and had been on shore, but were going away again to sea, being as loth, perhaps, to have stayed in this desolate island as I would have been to have had them.

While these reflections were rolling upon my mind, I was very thankful in my thought that I was so happy as not to be thereabouts at that time, or that they did not see my boat, by which they would have concluded that some inhabitants had been in the place, and perhaps have searched farther for me. Then terrible thoughts racked my imaginations about their having found my boat, and that there were people here; and that, if so, I should certainly have them come again in great numbers, and devour me; that if it should happen so that they should not find me, yet they would find my inclosure, destroy all my corn, carry away all my flock of tame goats, and I should perish at last for mere want.

Thus my fear banished all my religious hope; all that former confidence in God which was founded upon such wonderful experience as I had had of his goodness, now vanished; as if he that had fed me by miracle hitherto, could not preserve by his power the provision which he had made for me by his goodness. I reproached myself with my easiness, that would not sow any more corn one year than would just serve me till the next season, as if no accident could intervene to prevent my enjoying the crop that was upon the ground. And this I thought so just a reproof, that I resolved for the future to have two or three years' corn beforehand, so that whatever might come, I might not perish for want of bread.

These thoughts took me up many hours, days, nay, I may say, weeks and months; and one particular effect of my cogitations on this occasion I cannot omit; namely, one morning early, lying in bed and filled with thoughts about my danger from the appearance of savages, I found it discomposed me very much; upon which those words of the Scripture came into my thoughts, "Call upon me in the day of trouble, and I will deliver thee, and thou shalt glorify me."

In the middle of these cogitations, apprehensions, and reflections, it came into my thoughts one day, that all this might be a mere chimera of my own, and that this foot might be the print of my own foot when I came on shore from my boat. This cheered me up a little too, and I began to persuade myself it was all a delusion; that it was nothing else but my own foot; and why might not I come that way from the boat as well as

I was going that way to the boat? Again, I considered also that I could by no means tell for certain where I had trod, and where I had not; and that, if at last this was only the print of my own foot, I had played the part of those fools who strive to make stories of spectres and apparitions, and then are themselves frighted at them more than anybody else.

Now I began to take courage, and to peep abroad again; for I had not stirred out of my castle for three days and nights, so that I began to starve for provision; for I had little or nothing within doors but some barley cakes and water. Then I knew that my goats wanted to be milked too, which usually was my evening diversion; and the poor creatures were in great pain and inconvenience for want of it; and indeed it almost spoiled some of them, and almost dried up their milk.

Heartening myself, therefore, with the belief that this was nothing but the print of one of my own feet (and so I might be truly said to start at my own shadow), I began to go abroad again, and went to my country-house to milk my flock; but to see with what fear I went forward, how often I looked behind me, how I was ready, every now and then, to lay down my basket, and run for my life; it would have made any one have thought I was haunted with an evil conscience, or that I had been lately most terribly frighted; and so indeed I had.

However, as I went down thus two or three days, and having seen nothing, I began to be a little bolder, and to think there was really nothing in it but my imagination; but I could not persuade myself fully of this till I should go down to the shore again, and see this print of a foot, and measure it by my own, and see if there was any similitude of fitness, that I might be assured it was my own foot. But when I came to the place first, it appeared evidently to me, that when I laid up my boat, I could not possibly be on shore anywhere thereabouts. Secondly, when I came to measure the mark with my own foot, I found my foot not so large by a great deal. Both these things filled my head with new imaginations, and gave me the vapors again to the highest degree, so that I shook with cold like one in an ague, and I went home again, filled with the belief that some man or men had been on shore there; or, in short, that the island was inhabited, and I might be surprised before I was aware; and what course to take for my security I knew not.

This confusion of my thoughts kept me waking all night, but in the morning I fell asleep, and having by the amusement of my mind been, as it were, tired, and my spirits exhausted, I slept very soundly, and awaked much better composed than I had ever been before. And now I began to think sedately; and, upon the utmost debate with myself, I concluded that this island, which was so exceeding pleasant, fruitful, and no farther from the main-land than as I had seen, was not so entirely abandoned as I might imagine. That although there were no stated inhabitants who lived on the spot, yet that there might sometimes come boats off from the shore, who either with design, or perhaps never but when they were driven by cross winds, might come to this place.

That I had lived here fifteen years now and had not met with the least shadow or figure of any people before; and that, if at any time they should be driven here, it was probable they went away again as soon as ever they could, seeing they had never thought fit to fix there upon any occasion to this time.

That the most I could suggest any danger from was from any such casual accidental landing of straggling people from the main, who, as it was likely, if they were driven hither, were here against their wills; so they made no stay here, but went off again with all possible speed, seldom staying one night on shore lest they should not have the help of the tides and daylight back again. And that, therefore, I had nothing to do but to consider of some safe retreat, in case I should see any savages land upon the spot.

Now I began sorely to repent that I had dug my cave so large as to bring a door through again, which door, as I said, came out beyond where my fortification joined to the rock. Upon maturely considering this, therefore, I resolved to draw me a second fortification, in the manner of a semicircle, at a distance from my wall, just where I planted a double row of trees about twelve years before, of which I made mention; these trees having been planted so thick before, there wanted but a few piles to be driven between them, that they should be thicker and stronger, and my wall would be finished.

So that I had now a double wall, and my outer wall was thickened with pieces of timber, old cables, and everything I could think of to make it strong; having in it seven holes about as big as I might put my arm out at. In the inside of this I thickened my wall to about ten feet thick, continually bringing earth out of my cave, and laying it at the foot of the wall, and walking upon it; and through the seven holes I contrived to plant muskets, of which I took notice that I got seven on shore out of the ship; these, I say, I planted like my cannon, and fitted them into frames that held them like a carriage, that so I could fire all the seven guns in two minutes' time: this wall I was many a weary month in finishing, and yet never thought myself safe till it was done.

When this was done, I stuck all the ground without my wall, for a great way every way, as full with stakes or sticks of the osier-like wood, which I found so apt to grow, as they could well stand; insomuch that I believe I might set in near twenty thousand of them, leaving a pretty large space between them and my wall, that I might have room to see an enemy, and they might have no shelter from the young trees, if they attempted to approach my outer wall.

Thus in two years' time I had a thick grove, and in five or six years' time I had a wood before my dwelling, grown so monstrous thick and strong that it was indeed perfectly impassable; and no man of what kind soever would ever imagine that there was anything beyond it, much less a habitation. As for the way I proposed myself to go in and out (for I left no avenue), it was by setting two ladders, one to a part of the rock which was low, and then broke in, and left room to place another ladder upon that; so, when the two ladders were taken down, no man living could come down to me without mischiefing himself; and if they had come down, they were still on the outside of my outer wall.

Thus I took all the measures human prudence could suggest for my own preservation; and it will be seen at length, that they were not altogether without just reason, though I foresaw nothing at that time more than my mere fear suggested.

While this was doing I was not altogether careless of my other affairs; for I had a great concern upon me for my little herd of goats: they were not only a present supply to me upon every occasion, and began to be sufficient for me without the expense of powder and shot, but also abated the fatigue of my hunting after the wild ones; and I was loth to lose the advantage of them, and to have them all to nurse up over again.

To this purpose, after long consideration, I could think but of two ways to preserve them; one was to find another convenient place to dig a cave under ground, and to drive them into it every night; and the other was to inclose two or three little bits of land, remote from one another, and as much concealed as I could, where I might keep about half a dozen young goats in each place; so that if any disaster happened to the flock in general, I might be able to raise them again with little trouble and time; and this, though it would require a great deal of time and labor, I thought was the most rational design.

Accordingly I spent some time to find out the most retired parts of the island, and I pitched upon one, which was as private, indeed, as my heart could wish; for it was a little damp piece of ground in the middle of the hollow and thick woods, where, as is observed, I almost lost myself once before, endeavoring to come back that way from the eastern part of the island. Here I found a clear piece of land, near three acres, so surrounded with woods that it was almost an inclosure by nature; at least it did not want near so much labor to make it so as the other pieces of ground I had worked so hard.

I immediately went to work with this piece of ground, and in less than a month's time I had so fenced it round that my flock or herd, call it which you please, which were not so wild now as at first they might be supposed to be, were well enough secured in it. So, without any farther delay, I removed ten she-goats and two he-goats to this piece; and when there, I continued to perfect the fence till I made it as secure as the other, which, however, I did at more leisure, and it took me up more time by a great deal.

All this labor I was at the expense of purely from my apprehensions on the account of the print of a man's foot which I had seen; for as yet I never saw any human creature come near the island, and I had now lived two years under these uneasinesses, which indeed made my life much less comfortable than it was before, as may well be imagined by any who know what it is to live in the constant snare of the fear of man.

But to go on; after I had thus secured one part of my little living stock, I went about the whole island searching for another private place to make such another deposit; when wandering more to the west point of the island than I had ever done yet, and looking out to sea, I thought I saw a boat upon the sea at a great distance. I had found a perspective glass or two in one of the seamen's chests, which I saved out of our ship; but I had it not about me; and this was so remote that I could not tell what to make of it, though I looked at it till my eyes were not able to look any longer. Whether it was a boat or not I do not know; but as I descended from the hill I could see no more of it, so I gave it over, only I resolved to go no more without a perspective glass in my pocket.

When I was come down the hill, to the end of the island, where indeed I had never been before, I was presently convinced that the seeing the print of a man's foot was not such a strange thing in the island as I imagined; and, but that it was a special Providence that I was cast upon the side of the island where the savages never came, I should easily have known that nothing was more frequent than for the canoes from the main, when they happened to be a little too far out at sea, to shoot over to that side of the island for harbor; likewise, as they often met and fought in their canoes, the victors, having taken any prisoners, would bring them over to this shore, where, according to their dreadful customs, being all cannibals, they would kill and eat them; of which hereafter.

When I was come down the hill to the shore, as I said above, being the S. W. point of the island, I was perfectly confounded and amazed; nor is it possible for me to express the horror of my mind at seeing the shore spread with skulls, hands, feet, and other bones of human bodies; and particularly I observed a place where there had been a fire made, and a circle dug in the earth, like a cock-pit, where it is supposed the savage wretches had sat down to their inhuman feastings upon the bodies of their fellow-creatures.

I was so astonished with the sight of these things that I entertained no notions of any danger to myself from it for a long while; all my apprehensions were buried in the thoughts of such a pitch of inhuman, hellish brutality, and the horror of the degeneracy of human nature; which, though I had heard of often, yet I never had so near a view of before; in short, I turned away my face from the horrid spectacle, my stomach grew sick, and I was just at the point of fainting, when nature discharged the disorder from my stomach, and, having vomited with an uncommon violence, I was a little relieved, but could not bear to stay in the place a moment; so I got me up the hill again with all the speed I could, and walked on towards my own habitation.

When I came a little out of that part of the island I stood still awhile as amazed; and then, recovering myself, I looked up with the utmost affection of my soul, and, with a flood of tears in my eyes, gave God thanks that had cast my first lot in a part of the world where I was distinguished from such dreadful creatures as these; and though I had esteemed my present condition very miserable, had yet given me so many comforts in it, that I had still more to give thanks for than to complain of; and this above all, that I had, even in this miserable condition, been comforted with the knowledge of himself, and the hope of his blessing, which was a felicity more than sufficiently equivalent to all the misery which I had suffered or could suffer.

In this frame of thankfulness I went home to my castle and began to be much easier now, as to the safety of my circumstances, than ever I was before; for I observed that these wretches never came to this island in search of what they could get; perhaps not seeking, nor wanting, or not expecting anything here; and having often, no doubt, been up in the covered woody part of it without finding anything to their purpose. I knew I had been here now almost eighteen years, and never saw the least footsteps of a human creature there before; and might be here eighteen years more as entirely concealed as I was now, if I did not discover myself to them, which I had no manner of occasion to do, it being my only business to keep myself entirely concealed where I was, unless I found a better sort of creatures than cannibals to make myself known to.

Yet I entertained such an abhorrence of the savage wretches that I have been speaking of, and of the wretched inhuman custom of their devouring and eating one another up, that I continued pensive and sad, and kept close within my own circle for almost two years after this: when I say my own circle, I mean by it my three plantations, namely, my castle, my country-seat, which I called my bower, and my inclosure in the woods; nor did I look after this for any other use than as an inclosure for my goats; for the aversion which nature gave me to these hellish wretches was such, that I was as fearful of seeing them as of seeing the devil himself; nor did I so much as go to look after my boat in all this time, but began rather to think of never making any more attempts to bring the other boat round the island to me, lest I should meet with some of these creatures at sea, in which, if I had happened to have fallen into their hands, I knew what would have been my lot.

. . . .

We must leave the words of Robinson Crusoe, and condense the rest of his adventures into a page.

Some months later another wreck was cast up, and from this he obtained a quantity of new stores. Two years afterward he was again alarmed by the arrival of another party of savages. They brought two prisoners. While they were cutting one up, the other ran away in Crusoe's direction. Three of the cannibals gave chase. Crusoe rescued the fugitive, who became his devoted servant. This incident taking place on a Friday, Crusoe called the black man Friday. He taught him many words of English, and the man became very useful and a welcome companion.

CRUSOE FINDS TWO MORE COMPANIONS, INCLUDING FRIDAY'S FATHER

One day Friday came running to his master in great alarm. A party of savages had arrived, and Friday was sure they had come for him. Comforting him as well as he was able, Crusoe armed himself and Friday and sallied out from his castle.

When they came in sight of the savages, the latter were seen eating a prisoner, while another captive was lying bound upon the sand. This captive was a white man. Crusoe and Friday fired upon the party, killing some and scaring the others. While Crusoe was attending to the white man Friday found a third prisoner lying in the bottom of one of the canoes. This captive proved to be his father.

As soon as he was able to give an account of himself, the white man, a Spaniard, proved to be one of a band of seventeen who had been shipwrecked and cast among the savages of the nation to which Friday belonged. They were treated well. But shortly afterward their friends went to war with a rival tribe, were beaten, and several of them, including the Spaniard and Friday's father, were taken prisoners. These two set out in a canoe to bring the other Spaniards to the island.

After their departure an English ship came in sight. From this vessel a number of men landed near Crusoe's habitation. They brought three prisoners. At dusk, while the men were asleep, Crusoe approached the captives and found that they were the officers of the ship. There had been a mutiny on board.

Crusoe released the three men, and after some exciting episodes the captain was restored to his ship. In this, after leaving the survivors of the mutineers on the island, Crusoe, taking Friday with him, left the island on December 19, 1686, the same day of the month in which he made his escape from Sallee.

In this vessel Crusoe arrived in England on June 11, 1687, after an absence of thirty-five years. Soon after, he went to Lisbon. He found out from letters that so well had his estate in the Brazils been managed that he was master of more than $25,000 and of an estate worth about $5,000 a year.

Returning to England, Crusoe married and settled down on a farm in Bedfordshire. But the old roving spirit came upon him again. After his wife's death he started out once more, revisiting his island, now a fairly thriving colony. He had many other adventures in China and Russian Tartary. Eventually he reached London again on January 10, 1705, after another absence of over ten years.

Defoe really wrote three books about Robinson Crusoe, not only telling his life, but giving his thoughts on many things. The story we have just read is told in the first and most interesting of these books.

THE NEXT STORY OF FAMOUS BOOKS IS ON PAGE 947.

A FRENCH FLEET SEARCHES IN VAIN FOR LOUISIANA

La Salle, the first commander of Fort Frontenac, heard much about the western country from the Indian traders. He had already traveled to the Ohio, and in 1681 he set out again and journeyed up the lakes until he reached the site where Chicago now stands. From that place he and his men set out for the Illinois. They went down that river to the Mississippi, and down the Mississippi to the Gulf of Mexico. After that La Salle went back to France, and was sent out again to found a city on the Mississippi. But he could not find the mouth of the river, and his men mutinied and killed him. This picture shows the search for the river.

THE HISTORY OF CANADA

IN Volume One you found a general description of the great continent of North America, and also some pages and pictures telling of the Canadian part of this division of the earth's surface. Here we tell you more about the Dominion of Canada. Much of its early history will also be told under the heading United States. We shall find that England and France for more than a hundred years struggled for the possession of the St. Lawrence River and for the right to take furs and fish. For a time it seemed that France would not only hold possession of Canada, but would also control the whole of the Mississippi Valley to the south of us as well. Finally the French power was overcome, but not until after a bloody war, of which you are about to learn.

FRENCH CANADA BEFORE THE CONQUEST

CONTINUED FROM 116

HENRY VII of England, not wishing to see Spain reap all the profits in the New World, signed a patent in 1496, in favor of John and Sebastian Cabot, for the discovery and conquest of new lands. In 1497 John Cabot reached North America—probably Newfoundland or Cape Breton. The next year he sailed again, and this time coasted down the rocky, mountainous shore of Labrador.

CORTEREAL, THE PORTUGUESE CAPTAIN AND SLAVE-TRADER

Portugal also wished to share in the spoils of the New World, so in 1500 Gaspar Cortereal, one of her greatest sea captains, was sent on a voyage of discovery. He landed on the coast of Labrador, seized a number of natives, embarked them on two of his ships and sent them back to Lisbon to be sold as slaves. He himself set out for home in the third ship at the same time, but was never heard of again. His brother sailed the next year to search for him, but he, too, was lost. In 1500, also, Pedro Alvarez Cabral took formal possession of Brazil for Portugal.

The next comers were the French, who were the first to make a real settlement on the northern part of the continent. The first Frenchmen to visit America were not ambitious explorers or seekers after gold. They were simple seafaring Norman and Breton fishermen who came to gather a harvest of fish from the teeming cod banks of Newfoundland. We have proof that these daring fishermen sailed their little fishing vessels to the banks shortly after Columbus discovered America, and soon such visits became yearly occurrences.

VERRAZANO, THE FLORENTINE, MAKES A VOYAGE UP THE COAST

King Francis I of France, however, was not satisfied with the modest spoils of his fishermen. He had his ambitions aroused by the great claims of Spain and Portugal in the New World, and in 1524 he sent out an expedition under Verrazano, an Italian sailor in his service.

This explorer visited Florida and sailed up the American coast to Maine. He took formal possession of the country for his royal master and called it La Nouvelle France. Apparently he was the first European to enter what is now the harbor of New York. King Francis was so well pleased with the success of the expedition that he fitted out another. But of this voyage no tidings were ever received from Verrazano or from any of his men.

JACQUES CARTIER OF ST. MALO, THE MASTER PILOT

On account of troubles at home it was ten years before King Francis could again turn his attention to America. In 1534 he gave his assent to the equipment of an expedition. Its command was given to Jacques Cartier of St. Malo, a hardy mariner who had often visited the fishing banks of Newfoundland. In the early summer Cartier sailed from St. Malo with two small vessels and 120 men. Twenty days later the coast of Newfoundland was reached and the tiny barks passed through the Straits of Belle Isle into the Gulf of St. Lawrence. Circling round, they passed close to the New Brunswick shore. In July they entered the Chaleur Bay, and Cartier landed on its coast at Gaspé. He took formal possession of the country in the name of the French king, and erected a large wooden cross as a sign of French sovereignty. Though he crossed to the island of Anticosti, he did not enter the St. Lawrence River, and on August 15 he sailed for France, taking with him two natives whom he had kidnaped while at Gaspé.

CARTIER SAILS UP THE ST. LAWRENCE AND DISCOVERS "CANADA"

The following May, Cartier embarked again for the New World. On August 10 his ships sailed into the St. Lawrence, so called because it was discovered on the feast day of the saint bearing that name. Guided by two savages, he sailed up the river to an island since named Isle d'Orleans. His native guides told him that the country was divided into three districts—Hochelaga, Canada and Saguenay. Here first we meet the name now borne by the Dominion. It is a word of Iroquois origin, meaning in the native tongue a collection of Indian dwellings.

Above the island, and nestling at the foot of a mighty rock on which the citadel of Quebec now stands, was the little Indian village of Stadacona. The natives, who had never before seen a white man, were very friendly. Donnacona, the chief, told the adventurers wonderful tales of the river and its shores, and Cartier determined to explore it. Leaving his ships at the St. Charles River, he set out with fifty of his men in a pinnace. They rowed up the mysterious river till they reached the first hill of any size that they had seen since leaving Stadacona. This mountain Cartier called Mont Royal. Its wooded crest now towers above the city of Montreal. Along the shore, sheltered from the northern blasts, was the town of Hochelaga. It was composed of about fifty tunnel-like dwellings and was surrounded by a strong wall of logs.

The bearded white men with their resounding trumpets were received with a mixture of awe and delight. They were thought to have come from heaven. The half-naked Indians brought all their sick to be healed, and on leaving, Cartier was showered with gifts of fish and corn.

THE HORRORS OF THAT CANADIAN WINTER

Cartier found that he could not get his boat past the rapids at Lachine and was forced to return to Stadacona. By this time it was too late to attempt to cross the Atlantic, so he resolved to pass the winter in Canada, and his men built a rude fort and surrounded it with palisades. They were ill provided with food, however, and in December scurvy of a violent nature broke out among them. Of the 110 men for some time not more than three or four were free from the disease. Twenty-six men died before April, and most of the others were at death's door, when an Indian gave Cartier a native medicine which cured the ailing Frenchmen. When spring returned they sailed for France, and took with them for presentation to the French king Chief Donnacona and several of his tribe whom they had treacherously seized.

THE FIRST SETTLEMENT BY WHITE MEN IN THE NORTH

On arriving home Cartier found his country distracted by religious dissensions and at war with the Roman Emperor Charles V. Amid such troubles he found his presence unheeded and his projects disregarded. The existence of Canada seemed to be ignored by king and country alike, and it was 1540 before Francis I could again listen to proposals concerning it. Many of his subjects were opposed to settlements, claiming that the weather was too cold and that gold and silver mines did not exist. However, it was finally decided that a profitable trade in furs could be obtained and that it was unwise to allow the other European countries to share the spoils of the New World among them.

The king, by royal edict dated June 15, 1540, gave Sieur de Roberval the right to raise a body of volunteers to make a permanent settlement in the New World, and Cartier was given the command of the vessels which were to convey the colonists to America. With a part of the little squadron he sailed early in the summer of 1541, and after a three months' stormy voyage he reached Newfoundland, where he awaited the arrival of Roberval. He failed to appear, so Cartier continued his voyage and cast anchor at Quebec, where the colonists landed and began to clear land for cultivation. Leaving his men thus employed, he ascended the river, hoping to get beyond the Sault St. Louis, but found it impossible to clear the falls.

Roberval did not put in an appearance, and Cartier prepared to pass the winter in the country. He sent two of his vessels to St. Malo to inform the king of his work and to inquire what had delayed Roberval.

In the spring the Indians became unfriendly, and he sailed with all his colonists for home. About the same time Roberval left France. The two small squadrons met off the shores of Newfoundland, but Cartier refused to turn back, and continued his homeward voyage.

Roberval sailed on to Cap Rouge and made preparations for the coming winter. Before spring fifty of his men had perished. But he is said to have visited the Saguenay and the country around. His object was to discover if gold and precious stones were to be found in the New World. He was unsuccessful. With the survivors of his party he went back to France.

HOW THE GREAT FUR TRADE WAS COMMENCED BY FISHERMEN

During the remaining years of the sixteenth century France was engaged in war and did not have the time to think of New France, and the red-skinned Canadians were left undisputed masters of their forests. Yet the banks of Newfoundland were visited yearly by French fishermen, some of whom found it profitable to spend part of their time in exchanging gifts with the Indians for furs. These furs were sold at a handsome profit, and it was not long before many fishermen devoted their entire time to the fur traffic. It attracted other adventurers, and by the end of the century a somewhat extensive trade in furs had been established.

SETTLEMENT AT TADOUSSAC A FAILURE

At length the fur trade attracted attention, and Pontgravé, a rich merchant of St. Malo, with two others, obtained a monopoly from the king, and Pontgravé sailed in the early summer of 1599 to establish a trading-post in Canada. Tadoussac, at the mouth of the Saguenay, a favorite meeting-place of many tribes of Indians, was chosen, and sixteen men were left to hold the place during the winter. But they had not yet learned to make proper provision for the cold months, and in the spring only two survivors were found. They, too, would have perished if they had not been cared for by friendly Indians. Thus the attempt at settlement ended in failure, and Tadoussac became a mere summer trading-post.

CHAMPLAIN, THE FOUNDER OF NEW FRANCE

Two years later a trading company, having secured the fur monopoly, fitted out an expedition for Canada. Captain Samuel Champlain, a distinguished naval officer, was invited to command the expedition, and with three vessels he set sail in 1603. Accompanied by Pontgravé, he ascended the river St. Lawrence as far as the Sault St. Louis. Upon his return to France his report so pleased King Henry that he promised to give all possible assistance to building up French interests in Canada.

THE FOUNDING OF THE COLONY OF ACADIA

The fur monopoly was now granted to Sieur de Monts, who had been one of the associates of Pontgravé. De Monts was an old friend of Henry IV of France, and through his influence it was ordered that all Huguenots were to enjoy religious freedom in the New World.

In March, 1604, De Monts and Champlain sailed with emigrants for Acadia. They passed along the coast and discovered the two rivers St. John and St. Croix, and on an islet at the mouth of the latter river De Monts decided to land his colonists. During the winter thirty-six of his men died from scurvy. As soon as spring came he set out in search of a more suitable place. On his return from a coasting voyage to Cape Cod he found that Pontgravé had arrived with forty colonists. This reinforcement raised the spirits of all. With fresh courage for the struggle, they finally chose a new home, and a small town was built and named Port Royal. The little colony flourished, but the spring of 1607 brought bad news.

De Monts had lost his monopoly, and the colonists were forced to abandon Port Royal and return to France. Poutrincourt in 1610 came over to Acadia with a fresh supply of colonists. He found the old buildings still standing, and the natives were delighted at the return of the French.

THE SMALL BEGINNING OF A FAMOUS CITY

Champlain was chosen to settle a colony on the St. Lawrence as a base for further exploration. He left France in 1608 and reached the spot where Cartier had spent two winters. Champlain found that the village of Stadacona had been destroyed. The place was deserted, and upon the site he laid the foundation of Quebec.

A SUCCESSFUL WAR THAT PROVED TO BE A COSTLY BLUNDER

During the year 1609 occurred an event which was the main cause of the prolonged and bloody conflict between the Iroquois and the French. Champlain took up the cause of the Algonquins, with whom the Iroquois were at war, and left Quebec with a few Frenchmen and a flotilla of canoes filled with Indians to attack the Iroquois. A large body of water was discovered, afterward called Lake Champlain, and upon its shores he met two hundred of the fiercest and bravest Iroquois. The war-whoop of the Indians was met by a discharge from Champlain's matchlock, and mistaking the flash for lightning, the superstitious Indians fled. The next year Champlain defeated them in a pitched battle at the mouth of the Richelieu, and from this time until Canada became an English colony the powerful Iroquois were always the bitterest enemies of the French.

CHAMPLAIN A GREAT EXPLORER AND A LAWGIVER

In 1613 Champlain, with five companions and two canoes, paddled up the Ottawa River to Rideau Falls. Two years later he made another expedition farther up the Ottawa, reached Mattawa, crossed by a short portage into Lake Nipissing, and then descended the French River into Lake Huron. In September he led a large party of the Hurons down the river Trent into Lake Ontario. There the Indians made an attack on a well-palisaded town of the Oneida Indians and were repulsed. Champlain was wounded and lost his great prestige.

In 1621 Champlain issued a number of ordinances for securing peace and order in the colony. This collection forms a kind of code and was the first that Canada possessed.

THE "COMPANY OF THE HUNDRED ASSOCIATES"

In 1627 an important step for the future of the new colony was made. Up to this time the colonists had devoted almost their entire time to the fur trade. Very little had been done toward clearing the forests and tilling the soil, and the great Cardinal Richelieu determined that more attention should be paid to colonization. To help in carrying out his plans he formed a new company of traders under the name of the Company of New France, more commonly called the Company of the Hundred Associates. Richelieu granted to its members the monopoly of trade and the power to govern New France and Florida, and the king gave the company two ships and made twelve of its chief members nobles. In return for these privileges the company undertook to send out four thousand settlers during the next fifteen years, with the agreement that each colonist should be of French birth and a Catholic. Thus did Canada pass once more from a royal to a commercial régime.

QUEBEC BECAME FOR THREE YEARS AN ENGLISH PROVINCE

Charles I of England took up the cause of the Huguenots and declared war against France. A fleet of war vessels was equipped in England to invade the settlements of New France and attack Quebec. In the summer of 1628 the English vessels reached the Gulf of St. Lawrence. They captured several French vessels laden with fish and furs. Then they met and defeated a French fleet sent over by the Hundred Associates with colonists and supplies for Quebec. Kirke, the English commander, satisfied with his success, returned to England. Quebec, deprived of its supplies, had a very hard winter, and when Kirke returned the following spring, it surrendered.

During the next three years Quebec was occupied by an English garrison, and the soldiers made much profit out of the fur trade with the Indians. The war, however, between England and France was brought to a close by the Treaty of St. Germain-en-Laye in 1632. By the terms of the treaty New France and

PLANTING THE BRITISH FLAG IN CANADA

In 1492 Columbus found America where he sought India. Five years later Englishmen, under Cabot,
discovered Newfoundland, and French fishermen went there to catch cod. From there they reached
Canada, and in 1534 Jacques Cartier arrived at what is now Newfoundland. He made two other journeys
to Canada, claiming it for France. Then Frenchmen tried to settle there, but it was not until Samuel de
Champlain was sent out by Henry IV of France, in 1608, that the French colonists succeeded. Cham-
plain explored and founded settlements, but he was not supported by his king, and in 1629 an English
force took him prisoner. Here we see him surrendering to the English. He was later released, and
died in Canada in 1635, after it was restored to the French.

Acadia were given back by England and Champlain was restored to his post.

NEW FRANCE MADE A ROYAL PROVINCE

The history of the country from 1633 to 1663 is but the history of the fur trade, the Jesuit missions and the struggle against the Iroquois. The Company of the Hundred Associates devoted all its time to the fur trade and paid little heed to colonization. Because it did not carry out this part of the agreement, the king in 1663 canceled its charter and New France was made a royal province.

THE FRENCH AND ENGLISH BECOME RIVALS

Meantime the English had gained a footing on the continent, and rivalry had sprung up between the two nations, each of which desired from the beginning to force the other out. The first clash came as early as 1613, when Samuel Argall set out from Virginia with an expedition to drive the French from Acadia. Port Royal was pillaged and the crops in the fields were destroyed. As a result of this raid Great Britain began to press her claims upon Acadia. After 1614 the land which King James of England had granted to the Plymouth Company between the 45th and 48th parallels of latitude was called New England.

There was now a New England and a New France, and Sir William Alexander, a loyal Scotsman, decided there should also be a new Scotland. From the king he obtained in 1621 a grant of the whole of Acadia under the general name of New Scotland, or Nova Scotia. Charles I renewed Alexander's charter and later established the Order of Baronets of Nova Scotia, each member of which, in return for a pledge to make actual settlements in the colony, received an estate of eighteen square miles. Admiral Kirke in 1628 declared Acadia to be under the rule of Sir William Alexander's Company, but the company did not prosper, and by the Treaty of 1632 Acadia was restored to France. The forces of Oliver Cromwell conquered the colony in 1654, but it was again restored to France by his successor.

HOW CANADA AS A FRENCH COLONY WAS GOVERNED

Under the new system of royal government the three most important persons in New France were the governor, the intendant and the bishop. The governor was the official head of the colony, and through him all negotiations with the Indian tribes and with the English colonies were conducted. In addition to the governor-general there were local governors at Montreal and Three Rivers. The intendant had charge of justice, police and finances, and may be called the king's business manager for the province. The bishop was the head of the Church.

These three, together with a body of councilors—at first five, afterward seven, and finally twelve—formed the Sovereign Council, the name of which was later changed to Superior Council. This council was a legislative body and a court of justice, and was bound to enforce the edicts of the king. This form of government caused much friction, and there were many bitter disputes between the governor-general, the intendant and the council. As the king, three thousand miles away, was the only one to decide these disputes, a strife would frequently last for months.

THE SEIGNIORIAL SYSTEM UNDER WHICH CANADA WAS SETTLED

The system adopted to advance settlement was a mild form of feudalism which was called the seigniorial system. Under this the king granted a large tract of land to a few gentlemen who each undertook to provide a certain number of armed men for the defense of the colony. Out of their large estates the seigniors made small grants to retainers, who in Canada were called "habitants."

The habitants owed military service to the seigniors, just as the seigniors owed service to the king, and in this way the seigniors had an armed force at their call. The seignior was required to keep a mill to grind flour and meal for his tenants, but in return he took a toll of the flour and meal. The habitants owed a certain number of days of free service each year to the seignior and paid him a fine on every sale of land; while if the seignior sold his land, or if he inherited property, except from his father or mother, the king claimed a part of the purchase money or the value of the land as his due.

In 1672 there arrived at Quebec the most famous of all the governors of New France—Louis de Buade, Count de Frontenac, called by the Indians the Great Onontio. He determined to compel the Indians to sell their furs to the French rather than to the English, who were trying to gain a share in the fur trade, and, accordingly, in 1673 he built Fort Frontenac where Kingston now stands, to intercept the fur trade. The great explorer La Salle was the first commander of the fort, and started from it on his journey to the Mississippi.

WAR BETWEEN FRENCH AND ENGLISH, AND THE LOSS OF ACADIA

After 1694 the French settlement continued to increase and aroused the jealousy of the English colonists to the south. Both parties, aided by the Indians, carried on a destructive border warfare.

In 1703 there broke out in Europe the War of the Spanish Succession, and the war soon led to hostilities in America. Several unsuccessful attempts were made by the New Englanders to take Acadia, and finally, in 1710, an expedition under Nicholson was sent on this mission. Port Royal was taken with little resistance, and this meant the capture of Acadia, which thus passed forever out of the hands of the French. The following year the English, under Admiral Walker, failed in an attack on Quebec. The Peace of Utrecht in 1713 brought peace for a time to America. By its terms France abandoned all claims to Hudson Bay, Acadia and Newfoundland, but retained Cape Breton, Prince Edward Island and certain fishing privileges off Newfoundland.

HOW THE FORTRESS OF LOUISBOURG WAS CAPTURED

During the thirty years' peace that followed, the English and the French in America were constantly on the verge of war. The French chose Louisbourg as a seat of government and at once commenced to fortify it.

Early in 1744 news reached the New World that war had been declared between England and France. In a few months American waters swarmed with French privateers, for which the harbor at Louisbourg provided a safe refuge, and the New Englanders determined that the town should be destroyed, and for that purpose fitted out an expedition. Under the leadership of William Pepperell it left Boston on the last day of March, 1745, and joined the English fleet under Admiral Warren. Louisbourg was besieged, and after a brave defense which lasted for seven weeks the town surrendered. A series of raids and counter-raids followed, but this border warfare was interrupted by the Peace of Aix-la-Chapelle in 1748, by which Cape Breton and the captured fortress of Louisbourg were restored.

The peace was but a truce, hostilities hardly ceasing in America. Beyond the Alleghenies, English traders had pushed their way into the Ohio valley, which was claimed by the French. The French objected and determined to fortify the Ohio valley by a line of forts. The English decided to drive their enemies out of the valley. General Braddock was sent out to do this work, but failed.

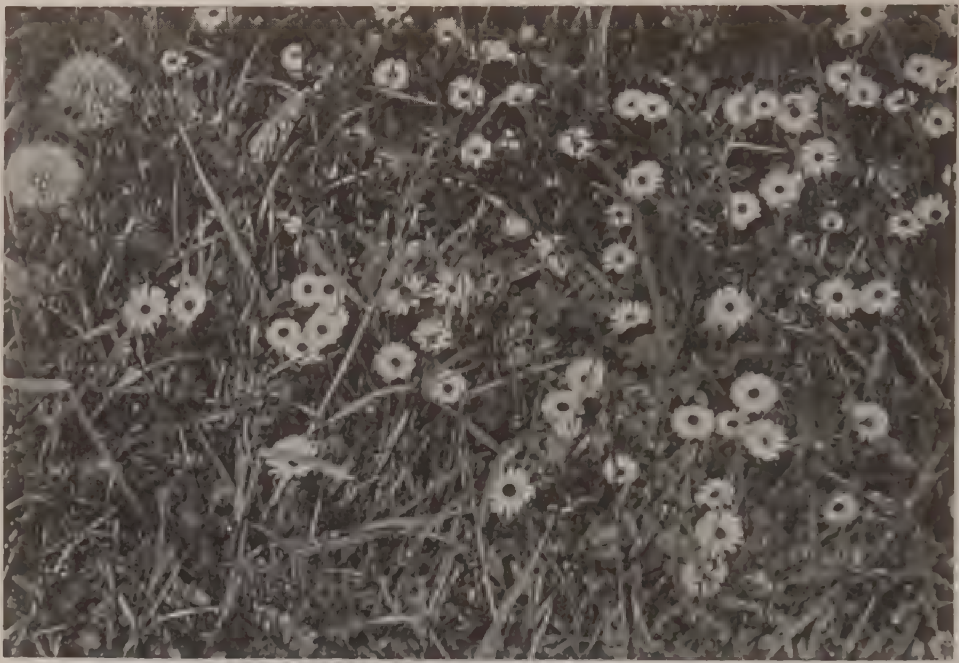
Louis XV, on the eve of war in Europe, could spare but few troops, but he sent to command his little army in America one of his bravest soldiers, the Marquis de Montcalm, who arrived in Canada in May, 1756, the same month that war was declared between his country and England. Both sides were very active in preparing for the coming struggle. In August, Montcalm captured Oswego, and followed this up by taking Fort William Henry, but, on the other hand, the English captured Louisbourg and destroyed it.

THE FALL OF QUEBEC AND THE DEATH OF TWO GREAT SOLDIERS

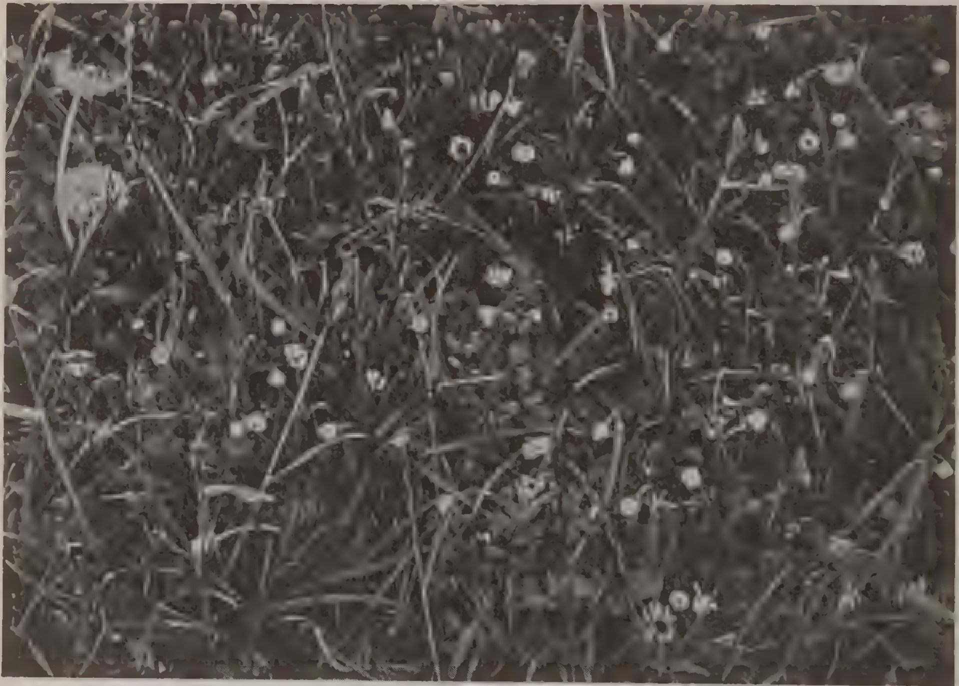
The British now prepared for a supreme effort to take New France, and Lord Amherst was ordered to march on Montreal, while General Wolfe was sent to capture Quebec. The fleet which bore Wolfe and his men reached the Isle d'Orleans near the end of June. His land force numbered less than 9,000 men, while Montcalm, who had taken vigorous measures for the defense of the city, and held almost an impregnable position, had 5,000 more. It was Wolfe's plan at first to tempt his opponent to battle, but in this he failed, and he decided to stake everything upon an attempt to scale the Heights of Abraham. The plan succeeded, and as morning broke on September 13, 1759, the British troops stood on the Plains of Abraham and faced the French army. But charging at the head of his grenadiers, Wolfe was fatally wounded, and with the din of victory ringing in his ears he died. In the rout which followed, Montcalm was wounded, and he, too, died the following day. The following year Montreal was captured, and this closed the struggle. By the Treaty of Paris in 1763 Canada remained a British colony.

THE NEXT STORY OF CANADA IS ON PAGE 941.

HOW THE DAISIES GO TO SLEEP



DAISIES LIFTING THEIR HEADS TO THE SUNLIGHT



THE DAISIES CLOSED IN THE COOL OF THE EVENING

Flowers, like all living things, must go to sleep sometimes, and most flowers sleep at night, as we do. Flowers and plants have a wonderful way of living partly on the air, which they change into food. All through the day the flowers take in some of their food from the air, and at night, while sleeping, they give back some that they have taken, so as to keep the air fit for our own use. Flowers take most of their food in the day and grow at night while asleep.

DOES A PLANT GO TO SLEEP?

CONTINUED FROM 587

As we usually use the word sleep, it means a condition in which consciousness of the outer world is lost. A man who sleeps does not see or hear what is going on around him. A man very sound asleep will not hear even the roar of guns and will have no knowledge of a thunderstorm raging round about him.

In this meaning of the word sleep the plants do not sleep. They have no sense of sight or hearing; and they do not see, so they cannot cease from seeing; and they do not hear, so they cannot cease from hearing. Yet, in the sense in which sleep is a periodical rest from activity, they may be said to sleep to varying degrees at various times.

We talk of the winter sleep of plants; and in winter plants do live a life so much less active than their summer life that they may be said to sleep. A green plant that has shed its leaves may, in more than the poet's sense, be said to be asleep. Without the green leaves it cannot make starch, or sugar, or woody fibre, or honey, or pollen, or buds, or flowers. It is not dead, but it is not working and making living tissues.

That is one sense, then, in which plants, in temperate climates at least, may be said to take a long sleep. But in much the same sense of rest from work every plant has a good sleep during the twenty-four hours. Almost all their work is done when the sun is shining. When the sun shines, they are busy breaking up carbon dioxid and building the carbon up into sugar and starch and other substances; but when the sun ceases to shine, all that wonderful chemical work ceases, too. The carbon dioxid is no longer broken up, no sugar or starch is formed, and so the plant may again be said to sleep. Indeed, the winter sleep of the plant in temperate lands is chiefly just a sleep of this kind—a sleep due to lack of sunshine.

In a third sense, flowers may be said to sleep when they close their petals. The daisy is said to shut its eyes. But this kind of sleep is not so real as the other kinds we have mentioned; for there are some flowers that open their petals at night—at the very time when they are doing little or no work. They sleep with open eyes.

In other cases flowers close their petals and curl up their leaves to retain moisture or to escape the sun's heat; but that also cannot properly be called sleep. They work with shut eyes, but they do not sleep. Sleep is rest, and when plants cease, or almost cease, from work and rest, then only can we rightly say that they sleep.

WHY IS IT THAT WE ARE NEVER SATISFIED?

There are a certain number of people in the world who *are* satisfied. They are to be found more especially in the East; but among the more active races of mankind it is scarcely possible to meet anyone who is satisfied. Even those who are contented look forward to a better life beyond this world. Now, we are always told that we should be satisfied, and that it is a great mistake always to go on striving and striving, and never to be content with things as they are.

But it is one of the highest marks of human nature at its best that it always goes on, and that, whatever it attains, it always sees that there is something better beyond. So someone invented the phrase "divine discontent" to express the splendid longing that is in the heart of man. This becomes divine when the longing is not for ourselves, but for others and for the future of mankind.

If we carefully study the development of life in the world, we find that this quality of not being contented, this power of forming a vision of the future and trying to realize it, is the great mark of mankind at its best. It is a blind and foolish mistake to complain that people are never satisfied. What we should try to do is to stop the foolish and trifling dissatisfactions around us and to replace them by something better.

WHY DO WE NOT SEE THE STARS BY DAY AND BY NIGHT?

The stars are shining all the time, sending light to the earth, but more than this is needed for us to see. The light they send must be able to reach our eyes, and reach them distinctly enough. By day the distinctness fails because the sun is so bright.

It has long been believed that, even in the daytime, we can see the stars if we look up at them from the bottom of a deep well, but this is not true. People believed it without trying for themselves, and when we try we find it is not true. It is true, however, that we can see the more conspicuous stars even in the daytime during a total eclipse of the sun.

At night the stars are often hid for other reasons. Clouds will hide them as effectually as if we close our eyelids or draw down our blinds. It is curious to think that rays of light may travel through many millions of miles toward our eyes and never reach them because of some little obstacle in the last small stage of their tremendous journey through space—a cloud, a blind, an eyelid, or even some opaque thing inside the eye.

Fog or mist, like clouds, hide the stars also; but it is well for us to remember that, day or night, whether the sky is clear or obscured by fog or mist or the heaviest clouds, whether our eyes are open or shut, in moonlight or in sunlight, the stars are still shining all the time.

WHAT KEEPS A SHELL FROM FALLING TO THE GROUND?

Not only does the shell not fall to the ground at once when fired, but it always travels in a curve of a certain kind, and all things travel along paths of this particular kind when they are thrown in a forward direction.

The path taken is the result of the working together of all the forces that act on, or in, the shell. If the shell were simply allowed to roll from the mouth of the gun, it would fall at once to the ground, for the only force then acting upon it to any extent would be the steady pull of the earth.

But when the shell is fired from the gun, it leaves the gun in a certain direction and with a certain amount of force, and though Newton's law of gravitation says that the earth is pulling the shell, his first law of motion says that every moving thing tends to move on in the same straight line at the same speed forever.

The actual path of the shell is the result of the acting together of several forces. Sooner or later gravitation gets the upper hand, especially as the resistance of the air helps it; but for every moving thing—a shell or an atom of gas in the air, or anything else—there is a certain speed at which it would leave the earth altogether.

WHY DOES BOILING WATER MAKE BUBBLES?

Bubbles in heated water are formed by the expansion and setting free of the air dissolved in the water. They form first at the bottom of the saucepan, because the layer of water there is nearer the source of heat, and is therefore first heated. The formation of bubbles, also, is always facilitated by the contact of the heated water with a rough surface such as the bottom of a pan. In a glass tube with a smooth bottom bubbles do not form so readily as in a rough kettle.

DOES THE EARTH TRY TO PULL A TREE DOWN?

Of course, gravitation is all the while trying to pull the branches of a tree down, and in some trees the branches bend down a good deal, especially if the tree is old and does not get enough good food from the soil. But the tree does its best to support its branches in their sideways position, which is best for their use, though it is, as we should say, a tiring position to be held in.

If we try to hold our own arms out sideways for ten minutes, we shall realize how great the pull of the earth on them is, and how inconvenient the position is. A tree's way of resisting gravitation is to build good strong wood in its branches, and to make this wood grow directly out of the wood of the trunk. In order to lighten the weight the wood has to hold up, the tree makes its leaves very light. The lightness of the leaves is thus very important for the life of the tree.

WHY, IF WE LOOK AT RED, DO WE AFTERWARD SEE GREEN?

Take a paint-box and paint a patch of vermilion on a piece of clean paper. Then look steadily at the red spot for a little while, and afterward at a piece of white paper. You will see a bright green spot of the same size and shape as the red blotch you painted. The explanation of this lies in an imperfection of the eye.

White light consists of all the colors of the rainbow put together; when we look at white, that is to say, we are looking at all the colors at once. If you take a part of white light away, the remainder is colored according to the part we have subtracted. For example, if we take red away from white, the remainder looks green. If we take blue away from white, the remainder is yellow. If we take white away from white, we have taken the whole and the result is black—that is, no light at all. Black is not a color; it is the absence of color.

Now we can understand why we see green after looking at red. When we stare hard at red, our eyes, being imperfect, get tired of the red. When we look away from it at white, we fail to see the red in the white, and perceive only what is left—the green. In the same way, if we look at a blue spot, and then turn away to white, our eyes, tired of blue, see only the remainder of the light, which is yellow. And if we look at a black spot on a white ground, and then look at a piece of white paper, we see a white spot on a black ground.

These pairs of colors, red and green, yellow and blue, are called complementary colors. Some people cannot distinguish the complementary colors from each other, and these people are called color-blind. That is a great danger as, for example, when a railway signalman—though he may not know it—is unable to distinguish the red light for danger from the green light for safety.

WHY MUST A BABY HAVE MORE SLEEP THAN A GROWN-UP?

There is no doubt that babies do require more sleep than grown-up people, and the smaller the baby, the truer this is. It has been well said that the "whole duty of infancy is sleeping and feeding." Grown-up people need sleep because they need a period of rest during which their bodies can save and make up for the wear and tear of the waking time. As long as a grown-up's body can just maintain itself, each night's sleep balancing the loss and injury of the day's work, all is well; no more is needed. But the body of a child has far more to do than this. It has to build up itself. While the body of a grown-up person is already made and has merely to maintain itself, the body of a child has to develop and grow. When it is awake, it takes its food, by which it grows, but the real growing is done when it is asleep. Then the body uses the food which has been taken in the daytime, and builds it up into itself. If a child does not get enough sleep, it cannot grow properly.

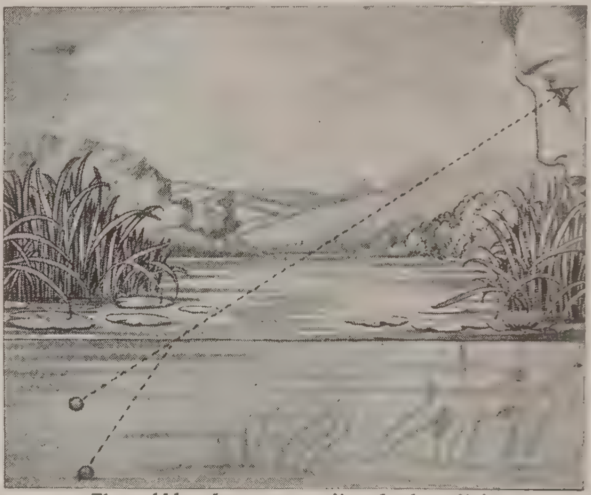
WHY DO OUR EARS SEEM TO SING AT TIMES?

The sounds we normally hear are caused by vibrations of the drum of the ear, set in movement by waves of air driven against it by other vibrating objects. But the singing sounds we sometimes hear in the ear are due to other causes. Often they are due to wax or some other substance in the orifice of the ear rubbing against the drum. Sometimes they are due to abnormal pressure of air in what is called the Eustachian tube—the tube which runs between the throat and the centre of the ear—or the middle ear, as it is called. Sometimes they are due to spasms of a little muscle within the middle ear. Sometimes—very rarely—they are due to disease of the ear. If we have any sort of trouble with our ears it should be looked after at once.

WHY DOES WATER ALWAYS SEEM SHALLOWER THAN IT IS?

When we turn on the bath water and our cake of soap falls into the water and sinks to the bottom, a curious illusion occurs. If we plunge our hand into the water to seize the soap, we find that *it is not where it seems to be.* It seems quite close to the surface, but our hand has to go much lower than our eyes direct in order to reach it. The eye is completely deceived into believing that the water is much shallower than it really is. Pebbles or fish in a pool always appear to be nearer to us than they really are.

The reason is that the rays of light reaching us from the object at the bottom of the water do not come straight to us, as they would do if there were no water between us and the object. The light from the object travels straight *as long as it is in the water,* but on emerging from the water into the air it is bent downward toward the surface of the water. This bending is called refraction, and it occurs whenever light passes from one transparent medium into another of different density—as, for example, from water to air, or from air to glass. The eye judges the position of an object by the direction of the light which comes to it, and therefore we imagine that the object has its position on the line taken by the ray after leaving the water. That, of course, places the apparent location of the object higher than the bottom of the water.


The pebble where we see it and where it is.

WHY DO OUR TEARS TASTE OF SALT?

You may say that there can be no harm in having sweat in our eyes, at least a little of it, for we have tears in our eyes, and they do not hurt us. But there is a great difference. Tears are made to wash the eyes, and there is no poison in them. In fact, if you took just the right quantity of pure table-salt, and melted it in perfectly pure water, you would have something almost exactly the same as tears; but water without any salt in it would not do for tears.

Perfectly pure water is found to injure delicate living things, like the front of the eyeball, and it is not natural to the body. If one were to fast and drink perfectly pure water for even a few days, one would become ill. The natural kind of water in which every part of the body lives its life is salt water. If you melt the right amount of salt in water, you have something which men who study these things call "normal salt solution," meaning that it exactly suits every part of the body, neither exciting it nor weakening it. This solution, which is just the same as tears, is used when we are studying any part of the living body; and it is used by surgeons rather than pure water, and all for the same reason. So that the next time you help yourself to salt, you will know where some of it goes.

WHY DOES QUICKSILVER ROLL UP INTO LITTLE BALLS?

The peculiarity of mercury compared with other liquids is that its molecules have a very powerful attraction for one another. We see this same attraction when water forms in drops. While water will form in drops on some surfaces, it will not on others. If we put a drop of water on a piece of blotting-paper, the attraction of the surface of the paper for the atoms of water is greater than their attraction for one another, and so the drop of water is broken up, and the water wets the paper. But though a drop of mercury is a true liquid, it will not wet the paper. Even if it is split up it simply splits up into smaller balls or drops. This is because the molecules of the mercury have a very much greater attraction for each other than they have for the surface of the paper.

WHAT IS MEANT BY THE SAYING THAT "ALL FLESH IS GRASS"?

In the Bible this striking phrase is used as a figure of speech—"the grass withereth, the flower fadeth," and so on; but the phrase is used in more than a metaphorical sense.

The whole of the animal kingdom feeds on substances which have already had a living existence as plants. This is true even of the carnivorous, or flesh-eating, animals, because, although they feed directly and mainly on the flesh of other animals, they indirectly eat herbs because their victims live on plant life. Thus it is literally true that "all flesh is grass."

The common opinion that flesh food is superior to plant food in strength-giving qualities is an error. Many of the strongest animals live entirely on vegetables. It is necessary to name only the buffalo, the elephant, the horse and the gorilla to remind ourselves that enormous physical power can be maintained solely by a vegetable diet. As a matter of fact, there is no element of the frame of man, or of any of the animals, which is not also found in plant life.

WHAT DOES THE EXPRESSION HORSE-POWER MEAN?

Power is the rate at which energy is being spent, or the rate at which work is being done. Though it is expressed in terms of horse-power, it bears no exact relation to animal horse-power. What we term a horse-power, however, is so called because it originated from the results of experiments carried out by James Watt more than a century ago with strong dray-horses. He wished to find out the rate at which a horse, under average conditions, does its work, and he fixed, as a round figure, 550 foot-pounds of work a second, or 33,000 foot-pounds a minute—that is to say, work equivalent to that needed to raise a weight of 550 pounds one foot high in one second. Watt took this as the value of a horse-power, although he realized that it was more than an average horse can do over a full day's work. Of course, a horse, if stirred by a whip, can exert a much greater power, but only for a very short time.

The expression horse-power is qualified in several ways. What is called "indicated horse-power" is the horse-power exerted on the piston of an engine. Some of this power is absorbed in driving the engine, and the balance remaining for doing the work of driving machinery is known as actual, effective, or more usually brake horse-power, and is the actual power given out by the engine or motor. Electrical horse-power is the equivalent of mechanical horse-power; one electrical horse-power is equal to 746 watts. The watt was named for the great inventor who experimented with horses. It is the amount of power brought by a current of one ampere flowing under a pressure of one volt.

WHAT ARE THE BROWN SPECKS IN CHINA?

The brown specks are due to minute particles of iron in the mixture from which the china is made. This consists mainly of china clay, ground flints, and stone, and other clays, which generally contain iron pyrites. When the materials are mixed together with water, all the iron particles must be removed if the finished china is to have an attractive and pure whiteness; so the mixture is run through long troughs in which are magnets to collect the particles. These magnets are fitted so that they can be easily removed, and the iron is then washed off. But it sometimes happens that particles drop back into the trough, or that all the iron is not taken out, and then, when a cup is being heated in the oven to harden, the iron particles appear as brown specks.

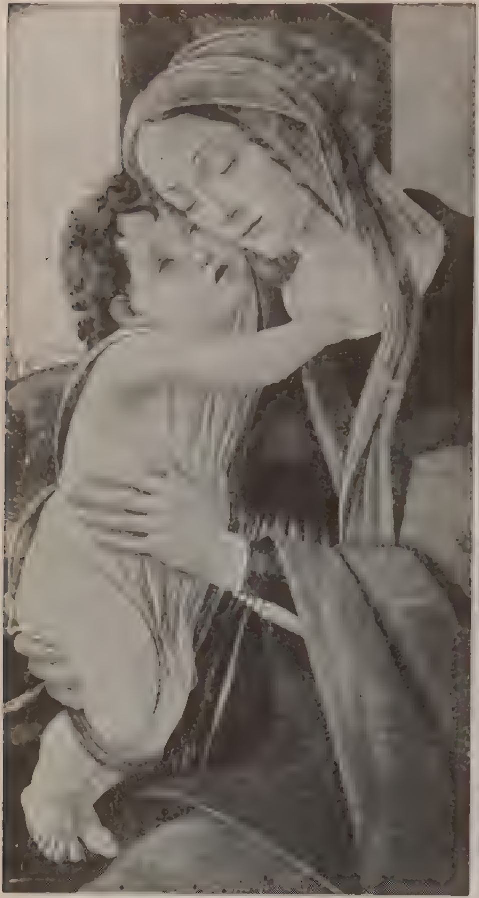
WHAT IS THE HOLE IN THE NIB OF A PEN FOR?

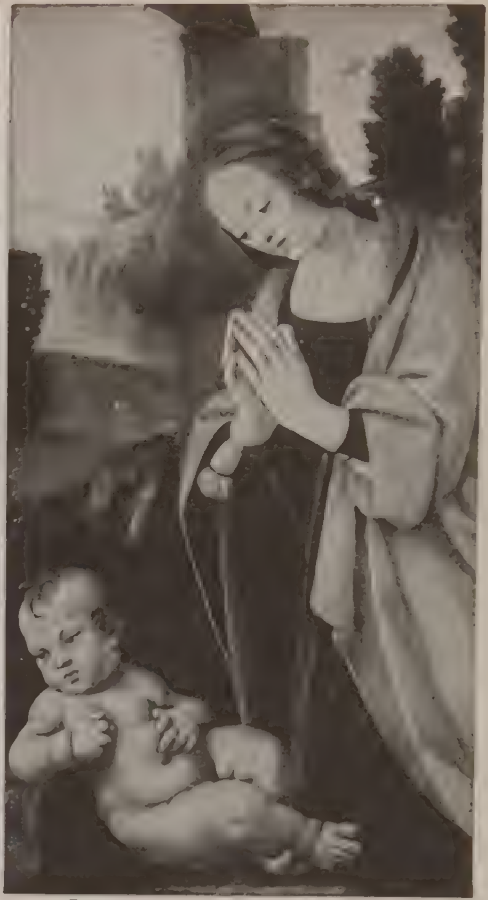
Ease and rapidity in making the up and down strokes in writing require, in addition to firmness, a certain degree of flexibility in the point of the pen. Therefore all pen nibs have a slit running to the point from a little hole cut in the middle of the nib where it begins to taper. The flexibility is sometimes increased by other slits cut in the nib. If a nib had no slit, its point would stick in the paper and cause the ink to splutter. The curvature of the nib permits it to hold a fair amount of ink, and the film that forms across the hole prevents the ink from running down and making a blot.

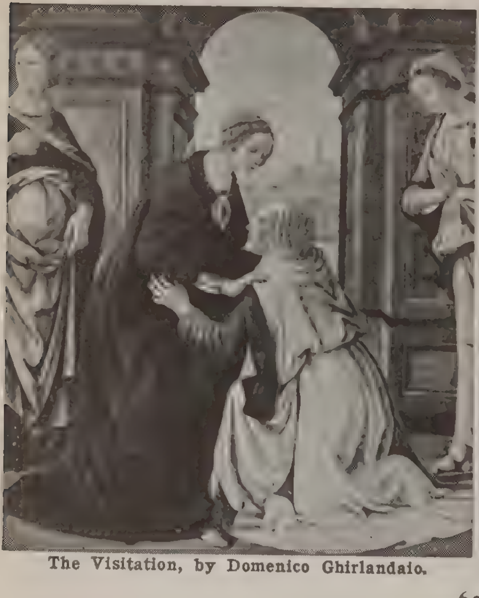
Sixteen processes are necessary to make an ordinary steel nib. The slitting is one of the last operations, and takes place after the point has been ground. It is interesting to recall that metal pens were first made from steel tubing filed into shape, the edges of the tube meeting to form the slit.

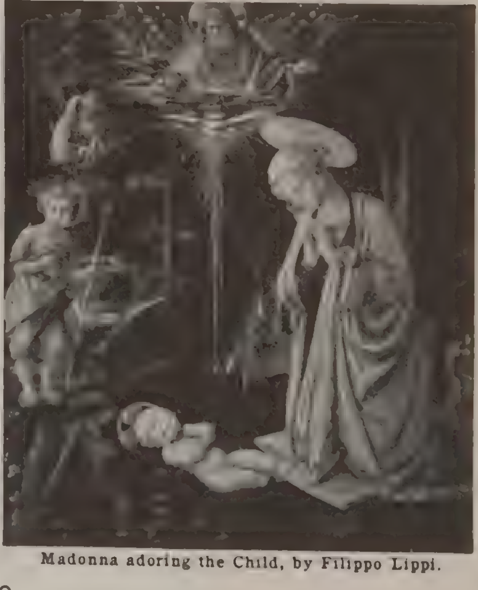
THE NEXT WONDER QUESTIONS ARE ON PAGE 875.

PICTURES BY FOUR ARTISTS OF FLORENCE


Botticelli's Madonna and Child.


Lorenzo di Credi's Madonna and Child.


The Visitation, by Domenico Ghirlandaio.


Madonna adoring the Child, by Filippo Lippi.

St. Francis and St. John with the Madonna, by Pietro Lorenzetti—On the church walls of Assisi.

THE WONDER MEN OF FLORENCE

CONTINUED FROM 582

THERE is a little town in Tuscany called Siena, a tranquil, if a dirty place, sitting in the sun. Lovers of beautiful things have a warm feeling for Siena; here in the thirteenth century were shown the first tender manifestations of that spiritual force called the Renaissance, the awakening of art after its long sleep.

The Renaissance in art was due to the workings of the Gothic movement north of the Alps. A very great beauty-sense lay behind this movement, as mysterious as beauty always is. It was something intensely airy and alive, with wild-flying wings, and very different from the heavy brooding of the Romanesque movement.

This lightness, this airiness, captured men's hearts and found its expression not only in buildings which flung up their lines like wheeling birds, but in statuary and colored shapes. From southern France the joy in lovely forms and natural beauty spread like a heavenly contagion. This feeling seems to have reached Duccio di Buoninsegna, the Sienese who was the first Italian painter that shows genius, and his fellow-townsmen had it to such an extent that when he had finished his great altar picture, they turned out in a body and carried it triumphantly to the cathedral. Bells rang from the steeples; the town had a holiday in honor of the beautiful thing.

This event, not the only one of its kind in the history of Italian art, throws a light on the peculiar workings of the Renaissance. For several hundred years ordinary citizens cared intensely about art. We can realize into what a far country we have traveled, how great is the gulf separating our cold selves from those ardent medieval people, if we try to imagine some of our communities making a triumphal procession for no other reason than that someone had painted a picture.

Duccio lived from about 1255 to 1340. Although he was a child of the Gothic period, his painting was a strange mixture of the new sense of beauty and the lifeless Byzantine grandeur which hung about Christian art in Italy like a gorgeous, stifling pall. Duccio tried to begin to understand and express what a living line meant. Byzantine lines were all dead. The Sienese artist must have known that a living figure has a certain vibration; he almost found it; he was obviously groping for it all his life, and in doing so he founded a style in which a delicate, pale emotion, a struggling for vitality, can be felt. Duccio's followers founded a school within a school; the Sienese within the Tuscan.

We are coming to a period in the story of art when men's names and dates crowd thick on the pages; and, as there is nothing quite so meaningless as a long string of words in an unfamiliar tongue, we will look at the painters in groups. If we can learn the characteristics of the various schools, we shall have gained enough knowledge to walk into a great art gallery or turn over a book on art, and say, without looking at the name on a picture, "that must be Sienese; that is Florentine, and that Venetian."

THE STRANGE COUNTRY IN THE ROOMS OF A GALLERY OF PRIMITIVES

The great men of the periods we shall unconsciously learn in learning the schools; then we shall be in the happy position of knowing the language of a strange country.

For, there is no doubt about it, any gallery owning a collection of *primitives* is, on the first dozen visits or so, a strange country to most of us. To thousands of people it is never anything else. They go there as a duty. They have been told by enthusiastic people that the gallery contains certain beautiful pictures, but they themselves find them simply ugly; they walk away, and afterward avoid the gallery. Thus one of the richest treasures of our inheritance becomes meaningless.

This is partly because eyes are untrained and partly because beauty is a relative term. All artists strive to express the beautiful, and some succeed better than others. Each man's work is important in itself as an expression of his individual sense of beauty, and also important in the part it plays in the world-movement of all the arts toward the expression of absolute beauty.

SOME POINTS TO REMEMBER IN STUDYING PICTURES

The paintings of the Sienese show a sense of beauty that is historic rather than individual. The painters knew little of technique or perspective, or often of ordinary drawing. They worked in watercolor on linen stretched on wood, the fabric having been first dressed with glue. They used a great deal of gold, laying it on the canvas in leaf and afterward burnishing it, according to the dying-out Byzantine tradition. Their art was elementary, and they are truly called primitives. For their work marks the *first* step away from the real Byzantine, and that, in the history of art, was a step toward the realization of ultimate beauty.

In trying to understand pictures which according to the judgment of centuries of thinkers are great, we have to take into account more than drawing and color and subject. A point of great importance in the study of the early Italians is the period of the various artists. For this reason we should try to look at a Renaissance picture from the standpoint of the painter himself, and forget that we are onlookers of a far later day.

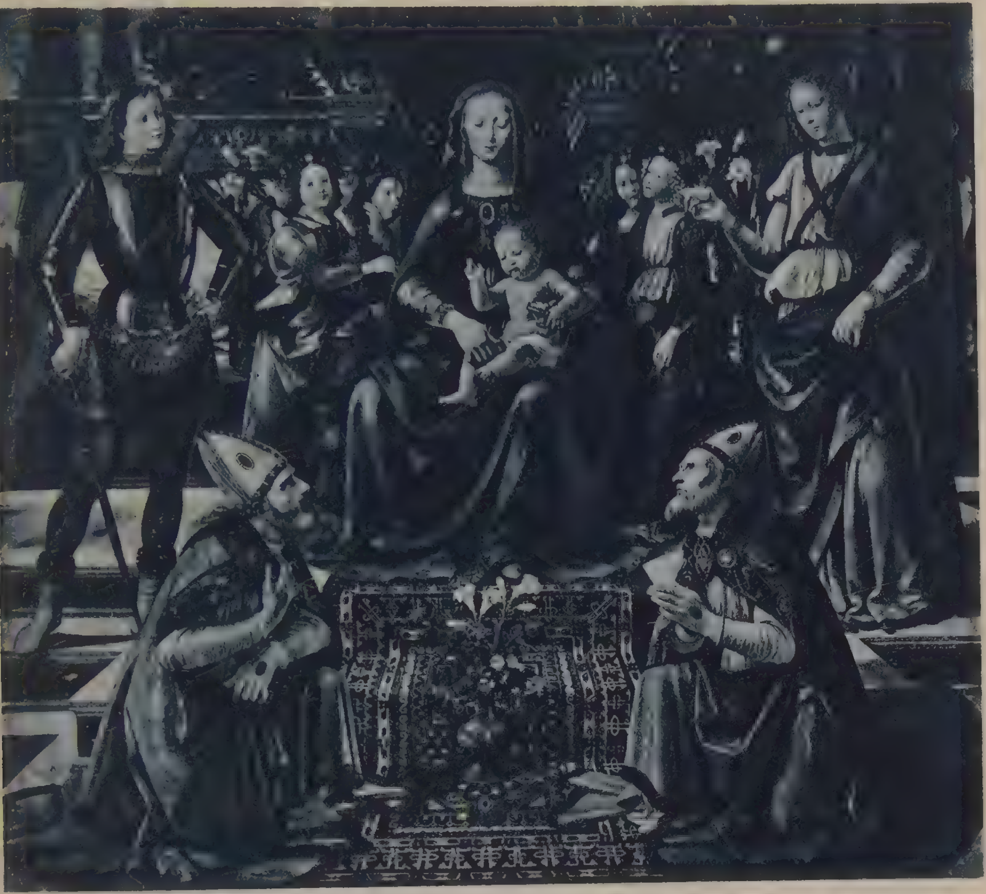
For instance, painters of early Italian religious pictures had been used to seeing, every time they went to church, wall-paintings or mosaics of biblical subjects. These decorations had been made by order of the Church, certain subjects to fill certain panels, the type of person in the picture settled once and for all, it seemed, by the Council of Nicæa.

THE NEW JOY PREACHED BY ST. FRANCIS, WHO LOVED THE BIRDS

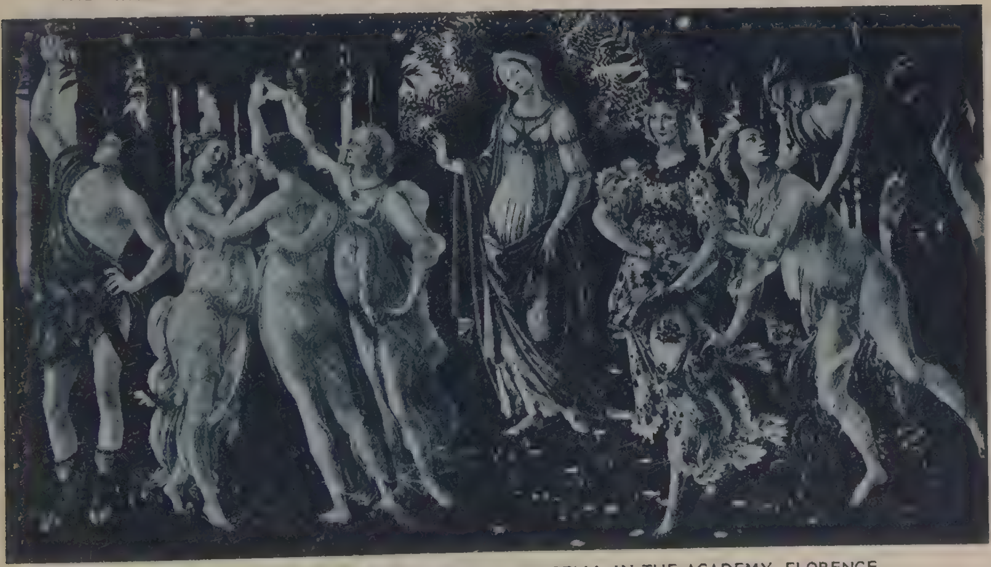
There was no room for individual treatment. Imagine, therefore, when these rules were relaxed, the intense joy the early artists had in painting a saint without doing it to pattern. Imagine how they would look on the work as a labor of love and not as an order to make a picture, when they could give more thought to their own ideas. We should try to remember this when we see the quaint, wry-necked saints of the Sienese school, or Duccio's very badly drawn Madonna with a worse-drawn toy Child in her lap.

We should remember that artists are always influenced by what they are thinking about. The Sienese school grew up just after Dante had written his wonderful allegory, and the visions of the poet had been set free to creep into other men's thoughts. And that dear saint, Francis of Assisi, had been going to and fro, preaching and teaching. The spiritual life of thirteenth-century northern Italy is closely bound to that good man. He was in literature and religion what the Gothic spirit was in architecture and statuary—something alive and tender, unbound by tradition. To ourselves, now, the book called The Little Flowers of St. Francis is very precious. What must it have been to have lived in the very place where the memory was warm of the saint who spoke of his little sisters the Birds and his big brother the Sun?

THE DAWN OF ITALY'S GOLDEN AGE



THE VIRGIN WITH THE INFANT CHRIST, BY GHIRLANDAIO, IN THE UFFIZI GALLERY, FLORENCE



AN ALLEGORICAL PICTURE OF SPRING, BY BOTTICELLI, IN THE ACADEMY, FLORENCE

THE FLIGHT INTO EGYPT. FROM A PAINTING BY GIOTTO, IN THE ARENA CHAPEL AT PADUA

THE NATIVITY. FROM THE PAINTING BY FRA ANGELICO, IN THE SAN MARCO MUSEUM, FLORENCE

THE VIRGIN WITH THE INFANT JESUS. FROM THE PAINTING BY BOTTICELLI IN THE UFFIZI GALLERY, FLORENCE

ST. AUGUSTINE READING PHILOSOPHY AT THE SCHOOL OF ROME. FROM THE PAINTING BY BENOZZO GOZZOLI AT SAN GIMIGNANO

ONE OF THE THREE WISE MEN,
BY BENOZZO GOZZOLI

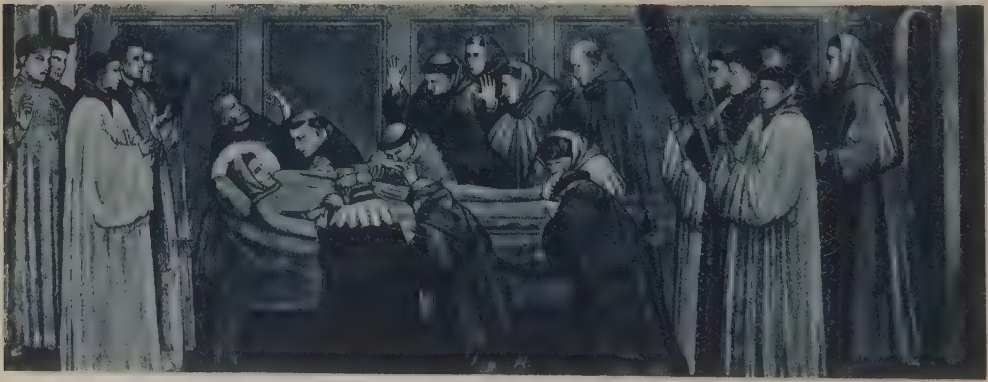
THE ANGEL OF THE
ANNUNCIATION, BY MEMMI

PORTRAIT OF A LADY, BY
PIERO DELLA FRANCESCA

SAINT FRANCIS,
BY BARTOLI TADDEO

THE BETRAYAL BY JUDAS. FROM THE PAINTING BY
CIMABUE, IN THE CHURCH OF ST. FRANCIS AT ASSISI

THE VIRGIN, BY
LORENZO DI CREDI



THE DEATH OF SAINT FRANCIS, BY GIOTTO, IN THE CHURCH OF SANTA CROCE, FLORENCE

The new joy preached by St. Francis was the secret of the greatness and the weakness of the Sienese artists. Their best work is warm with an individual feeling, a struggle to make a personal, living thing out of lines and colors and tones. They did not think and plan sufficiently, but allowed a beautiful emotion to take the place of mental effort. Their greatest artists were Duccio, Simone Martini, known as Memmi, Ambrogio and Pietro Lorenzetti and Bartolo. After the fourteenth century the art of Siena died out for want of strength and vigor.

Side by side with the Sienese school grew another, the Florentine. A number of pictures showing something of the Sienese spirit have been attributed to Cimabue, the early Florentine, and many charming stories cluster around this captivating figure. But art historians believe that many pictures said to be Cimabue's work were painted by someone else—probably by Duccio or his followers—as the Florentine was a worker in mosaics and followed the Byzantine lines of tradition.

The Madonna and Child painted six hundred years ago by Duccio.

Florentine art was a very great movement—an intellectual force producing a number of the most wonderful artists of the world, among them two giants—Leonardo da Vinci and Michelangelo. The first of these notable Florentines was Giotto. He may quite possibly have been influenced by Duccio in the neighboring town, but he showed in his work the clear precision which was to mark the Florentine school and separate it from the gentle and poetic Sienese.

There are many legends about Giotto, one being that Cimabue found him a shepherd boy in the mountains drawing sheep on the rocks; another that he was apprenticed to a wool-merchant and spent his time watching artists at work. Be his origin what it may, Giotto himself is beyond argument a forceful genius with a mind open to all that was beautiful.

He had a keen dramatic sense, and could seize upon the most vivid actions and attitudes in the people he was painting. Intensely as he cared about his work, he never allowed sympathy to overweigh judgment. For instance, while portraying the grief and horror of some persons at the sudden death of a friend, in one of his great pictures, The Knight of Celano, he still kept his attention clear for the innumerable details of character, dress and personal appointments which, if treated in the right proportion, make for strength in a picture. Giotto took the second step along the road to the realization of the Italian ideal of beauty: he turned completely from the chilling Byzantine traditions which still lingered among the Sienese. When we look at his work, we see many faults of drawing, but we see that he battled with the problem of making a projection of color and shape on a flat surface look as much a solid human being as if it had been sculptured in the round. Giotto's coloring was always clear and pale—another move away from the heavy Byzantine tone of richness.

To understand the work of this pioneer among artists it is necessary to look, not only at his pictures, but at his frescoes in Padua and Assisi, and especially in Florence, remembering that a fresco is painted on the wall itself in water-color, before the plaster is dry. A great many Italian artists painted in fresco, and this kind of painting forms a most important part of the study of their work. Some people are very much disappointed when they go to Italy and see the frescoes of Giotto for the first time, because the paintings are faded and at first sight appear a little unconvincing.

But such people have not learned the lesson we have been learning—of looking at an artist's work from the point of view of the painter and the period. Keeping that in our minds, we are not so likely to make a wrong judgment, because we shall not expect the brilliance of a modern oil-painting when we are looking at plaster pictures which have been exposed to light and heat for a thousand years, and which were painted by a man who, though a great genius, could not draw properly.

THE IMMORTAL GIOTTO WHO "TOOK HILLS AT A STRIDE"

Most of Giotto's frescoes are subjects from the life of St. Francis, cycles of beautiful stories. They adorn churches in Florence, Assisi, Padua and Rome. There are important panel pictures from his brush, too. One of Giotto's paintings is in the Louvre, another in the Munich gallery. The Metropolitan Museum has a picture which is attributed to Giotto and others are in private galleries.

Giotto died in 1337, but his spirit lived on over a hundred years. It took many generations of painters to reach the point where his progress had stopped. Giotto had taken hills at a stride. His followers plodded on, content merely to try to "catch up." They imitated and copied his style and work, and developed little or nothing on their own account. They were a numerous company and are known in art history as the Giotteschi.

The chief among them and the next best to the master was Andrea Orcagna. Another, Taddeo Gaddi, Giotto's favorite pupil and his godson, rather caricatured his master's style, exaggerating the long noses and faces and almond eyes which Giotto had introduced in place of the staring, round-faced Byzantine personations. But he was humble and knew his limitations. Sometimes he signed his work, "Taddeo, a disciple of Giotto, the good master."

FRA ANGELICO, THE GENTLE PAINTER WHO WEPT OVER HIS WORK

After Orcagna and Gaddi perhaps the best of the Giotteschi was Giovanni da Milano; then came Cennino Cennini, Andrea da Firenze, Antonio Veneziano, Spinella Aretino, Lorenzo Monaco. One of these men, Cennini, is chiefly remembered for a book on painting that he wrote, describing, among other things, Giotto's technique, and incidentally throwing a light on Tuscan habits and customs of the thirteenth century.

The greatest artist produced by the school of Giotto was the famous monk Fra Angelico of Fiesole, who lived from 1387 to 1455. He was a gentle and saintly painter, who felt intensely the inward meaning of all the subjects he portrayed and would frequently weep over his work. Fra Angelico's work lacks the strength of Giotto's, but it has a devoutness almost unrivaled. He accomplished an amazing amount of work, but comparatively little of it has survived. One of the treasures of the National Gallery in London is the predella for his altar picture Christ in Glory, painted for the Church of St. Domenico in Fiesole, the hill-top village above Florence. This panel picture is an inspiring and lovely thing—one of the rare flowers of the Renaissance.

Perhaps Fra Angelico used a little too much gold, because he thought that nothing short of gold was rich enough for portraits of Christ and the saints. In this way his work reminds us of the Sienese. But his careful composition and construction of figures is far indeed from the vagueness of the primitives.

Fra Angelico's favorite subject was the Annunciation; another theme he often painted was the Last Judgment. He was perhaps most happy in his pictures of Paradise. Earthly loves and hates hardly existed for him; all his affections soared outward to the heavenly land.

THE EXQUISITE PAINTER OF MAGICAL AND BEAUTIFUL EVENTS

Fra Angelico's pupil Benozzo Gozzoli was an idealist of another kind, loving to picture earthly as well as heavenly things. He has been called the most exquisite story-teller of the Renaissance, a painter of frescoes in which magical and beautiful events are shown. There was a slight tendency in master and pupil to make art visionary and apart from real life. Fra Angelico was first a saint and then a painter and Gozzoli was more an illustrator than either. His frescoes in the Riccardi Palace in Florence and elsewhere are like "the golden dreams of a child."

While Benozzo was but a child, a man was working who in his short life—he died in 1428 at the age of twenty-seven—brought a very different influence to bear on Florentine art. This was Masaccio. Masaccio's work was like a powerful, salt-nipped wind blowing through a languorous garden. He was very vigorous and realistic, indicating by his work that art should explain life, that life is not an affair of dreams, and that nature is the mistress of all masters. In Italian art Masaccio was the next strong force after Giotto; and like him, he influenced a century of followers.

Masaccio's greatest work was the decoration in fresco of the Brancacci Chapel of the Carmine monks in Florence. The subjects are various—the Fall of Man, the Expulsion from Paradise, and then onward, skipping the rest of the Bible to the Acts of the Apostles. This work makes an epoch in art. It is one of the stages by which progress can be counted. One of the pictures best showing Masaccio's strength is the Expulsion from Paradise.

BOTTICELLI, WHO WOULD SACRIFICE JUDGMENT FOR HIS LOVE OF LINE

Artists of varying qualities were influenced by Masaccio. There was Fra Filippo Lippi, whose work showed a curious mixture of Fra Angelico's saintliness and Masaccio's realism. One of Fra Filippo's pupils was Botticelli, who has perhaps been loved a little more than he deserves.

Botticelli was uneven in his work, allowing himself to be swayed by his passion for a lovely line; and in order to achieve this he sometimes sacrificed both judgment and reason. At his best, as in the Allegory of Spring in the Florence Academy, he is a very fine product of the Tuscan school, but his best does not often happen. Like all the Italians, he painted many Madonnas and kindred subjects, and numerous artists after him worked in his manner. Botticelli's line sometimes suggests the *tremolo* in music. He was born about 1446 and died in 1510.

THE GREAT VARIETY OF THE PICTURES OF PIERO DI COSIMO

Piero di Cosimo, whose work is not at first sight as attractive as Botticelli's, was in some ways a stronger artist. He painted all kinds of subjects, classical and biblical; he also painted exquisite portraits, of which La Bella Simonetta—a beautiful Genoese girl whom Botticelli also painted—is the most famous. There was a mingled delicacy and strength and distinction in Cosimo's work that marked it out even in a century of great artists. His use of color was agreeable and his landscape distinguished. In composition he was somewhat fantastic. The paintings of Cosimo are an excellent study to lead up to the work of the great Leonardo da Vinci, who was his contemporary.

Two more Florentines call for mention—Domenico Ghirlandaio and Lorenzo di Credi. Ghirlandaio, much the stronger artist of the two, was living at the same time as Botticelli, and shared with him many of the commissions upon which artists depended then, as now. Ghirlandaio had a strong instinct for large compositions, and he painted in vivid and clear color. He had an extraordinary capacity for work, and is said to have declared that he would like to paint all the walls of Florence in fresco. Naturally he fell short of this achievement, but in the forty years of his life he accomplished a great deal. He was content to paint subjects as subjects, people as people; he had no spiritual insight, and thus his work is marked by none of the idealism that distinguishes other men of his century. As decoration it is very fine, however.

LORENZO DI CREDI TOUCHED BY THE SPIRIT OF THE GREAT LEONARDO

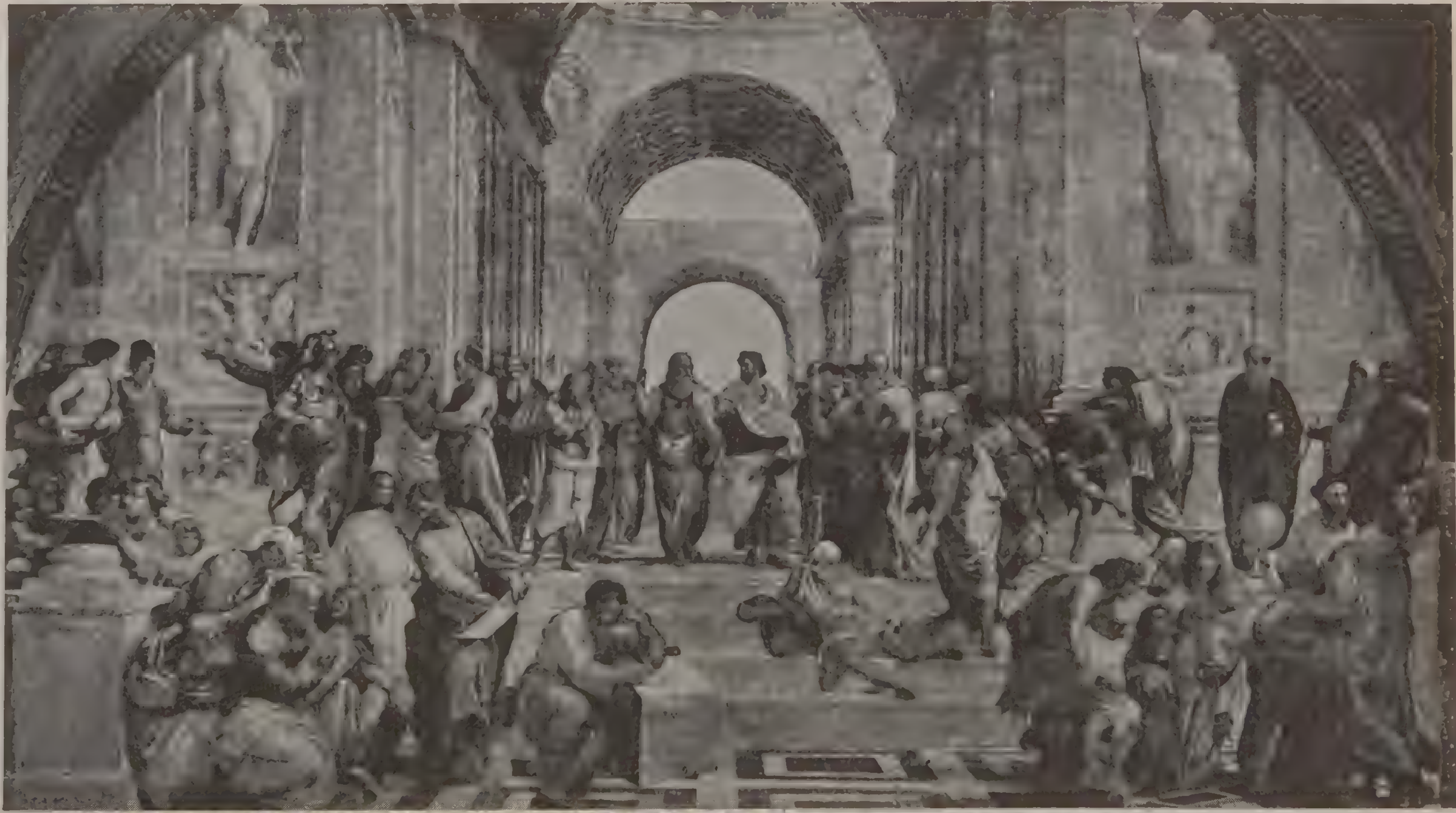
Lorenzo di Credi was the fellow-student of the great Leonardo da Vinci. We can see, when we have learned to judge this illustrious company of Florentines, that Lorenzo was a good second best. Like most of the men of his time, he ardently admired Leonardo and studied his style. Perhaps it may be said that a ghost of the other's greatness hides in Di Credi's work. Careful in drawing, he gave too much study to the working out of detail; and his painting shows more grace than force or originality. In the European galleries there are various fine examples of his work—usually the Madonna and the child—and he is represented in the Metropolitan Museum, the Boston Art Museum and other collections in America.

Another artist who lived in this amazing fifteenth century was Piero dei Franceschi, the Umbrian. His work was strangely cold and aloof; he preferred strength to beauty. Luca Signorelli was his pupil, and he had a strong feeling for composition for its own sake, regardless of individual figures.

After a little patience in sorting out these names and getting used to the idea of Italian art, we shall see how the work of the Florentine painters grew. It was a truly miraculous development, the mystical unskilled Sienese and the adventurous intellectual Florentines following one after another, until Leonardo came, and Michelangelo.

THE NEXT STORY OF THE FINE ARTS IS ON PAGE 823.

THE GREAT THINKERS OF GREECE IN THE GOLDEN DAYS OF ATHENS



The School of Athens, one of Raphael's great historical paintings on the walls of the pope's palace, represents great men of Greece. The central figures are Plato and Aristotle, with their disciples. On the left is Socrates talking to Xenophon and Alcibiades (in a helmet). Below are Democritus and Pythagoras; on their right sits Heraclitus. On the steps, to the right, lies Diogenes, and above, to his right Aristippus talks to Epicurus, Pyrrho and others. Below is Archimedes teaching geometry.

Demosthenes.

Alcibiades.

Zeno.

Philip of Macedon.

Solon.

Phidias.

Euclid.

Pericles.

Alexander.

Aristides.

THE GREAT GREEKS

CONTINUED FROM 596

GOETHE, one of the greatest poets and thinkers of modern Europe, said that in comparison with the Greek poets he was absolutely nothing. John Stuart Mill said the Greeks were the most remarkable people that have ever existed. Shelley declared that the most memorable period in the world's history belongs to Greece. Macaulay discovered "a new joy in life" when he returned to Greek authors.

All our science, literature and art began with this single people, "politically weak, numerically small, materially poor." We still use words which they invented; we still think in channels which they were the first to discover; our whole civilization moves in a course which they set for mankind five centuries before Jesus. To the Hebrews we owe our idea of one God. To the Romans we owe our idea of sanitary science. To the Greeks we owe nearly everything else.

Of the people we are now going to read about it has been said that even in their decay they were accustomed "to take little and to give much." That is high praise. Most nations live on other nations. No one nation of the modern world stands quite apart from the rest in moral or intellectual independence. How was it that the Greeks occupied this unusual position in the ancient world, taking little from other peoples and giving, not only to the nations of that time, but to all the nations of our own time, so much—so much that is still felt to be of eternal value? For an answer to this question, let us examine the lives of four Greek men.

Nearly six hundred years before the birth of Jesus there was born in the island of Samos a man named Pythagoras. Samos was ruled by a tyrant, and, rather than live under such conditions, Pythagoras made himself an exile and wandered about the world studying mankind. He set up a school, or brotherhood, into which men might come who hated the vulgar strife of life and desired to seek truth in peace and quiet. No idle chatter was permitted in this school, but the works of Homer and Hesiod were learned by heart; music and gymnastics were encouraged; the disciples were taught to conquer the crude appetites of their animal nature by work and study, in order that their inward and spiritual life might be enriched.

Some three hundred years before the birth of Jesus a Greek named Euclid filled a great space in the floor of one of his rooms with firm, smooth sand. Bending over this bed of sand, he drew shapes and figures—circles, triangles, parallel lines and squares. By his studies he laid the foundations of the science of geometry. All about him were people busy over magic, superstition, noisy politics, slander and social excitement. He turned his back upon them. What interested him in life was not anything which was merely fashionable at that time and in that place, but only that which was true for all time and in all places. Do not confuse him with another famous Euclid who lived at Megara in the fifth century B.C.—a pupil of Socrates who afterward founded a school of philosophy of his own.

THE GREAT DOCTOR WHO WROTE A BOOK TWENTY-FOUR CENTURIES AGO

Five hundred years before the birth of Jesus there was a doctor in Greece named Hippocrates. Refusing to follow the wizards and magicians of that time, he set himself to discover the laws of the human body. He knew that the science of medicine would constantly improve, and that what he taught would be only partially true; but he wrote a little book which is still studied by medical students in America and Europe because he was able to state what was eternally true in this great science of medicine.

One hundred years before the birth of Jesus there lived at Alexandria a man named Dionysius, known as Dionysius Thrax, because his father was a Thracian. When he heard people talking and chattering all about him, he listened intently to them, but not to take pleasure in their gossip; he was listening thus intently to the sounds of their lips because he wanted to discover what was eternal in those sounds. It had come to him that, though the words of men pass away, and though those words may often be foolish or contemptible, still there is something in them, something under them and through them, which is eternal. By this attention to what was eternal in human speech, instead of to what was merely the passing subject of talk, Dionysius unveiled to mankind the mysterious and unsuspected laws which govern language, and so discovered the science of grammar.

THE PECULIAR MARK OF GENIUS THAT DISTINGUISHED THE GREEK MIND

From the work of these four men in four such different spheres we may see quite simply the one glorious mark of genius which distinguished the Greek mind from all other minds in the world. It was an original mind, a questioning and exploring mind, a mind centred on a spiritual inwardness, and never lost or unbalanced in the whirl of external things.

The Greek thinker divided the things of life into two parts, the temporal, or passing, and the eternal. He was interested only in the eternal. He spoke of it as Excellence. It became for him the only Reality. He knew, as well as we know, that art and science will continually move forward, will never stand still, that the very mind of man is progressive; but he said that in spite of all this change and all this progress there is something in the universe, something in human life itself, which is steadfast, unchangeable, everlasting, unaltered by knowledge, and unaffected by science, something which has an eternal value, which is, as one writer says:

> Like the beauty of the dawn, or the love of a mother for her child, or the joy of a young animal in being alive, or the courage of a martyr facing torment. We cannot for all our progress get beyond these things; there they stand, *like light upon the mountains.*

THE SIMPLICITY OF TRUTH THE MEN OF ATHENS LOVED

Why should he be interested in fashion? Why should he run and shout with the excitable busybodies of the market place? Surely it was not the act of a sane man to be moved by any of the mere accidents of life. His whole mind should be set on the everlasting truths of human existence, not on things seen and temporal, but on things unseen and eternal, not on meat and raiment, fortune and fame, place and power, vanity and worldliness, but on the great thoughts of the human mind—Truth, Beauty and Goodness.

Here is a striking example of what the Greeks meant by preferring things eternal to things temporal; it is a comparison of Professor Gilbert Murray, who shows us how this spirit influenced their art. "Compare," he says, "an athlete in flannels playing tennis and a stout dignitary smothered in gold robes. Or compare a good modern yacht, swift, lithe, and plain, with a lumbering heavily-gilded sixteenth-century galleon."

In everything they did—in architecture and sculpture, in philosophy and science—the great men of Athens exercised this same quality of mind. They cared little for ornamentation and concentrated on the simplicity of truth. They cared for what was *essential.* They sought structure. They sought that which lies beneath all the disguises of changeful fashion. For them the young athlete stripped for a race was a beautiful object, a thing of truth; a stout dignitary smothered in gold robes would have seemed to them merely an expression of falsehood and vulgarity.

If we keep this thought in our minds, the thought that Greek genius consciously turned from what is not essential to truth, and consciously chose to be interested only in spiritual realities, we shall better understand the influence of their greatest men on the thought of the whole world.

Some 640 years before the birth of Jesus there was born, of royal Athenian stock, a great statesman and lawgiver named Solon, whose wisdom and virtue remain to this day a treasured possession of the human race. In those times the small state of Athens was distracted to the point of anarchy. A rich money-lending aristocracy exerted the most cruel tyranny over the trading middle classes. A man who owed money which he could not pay was made a slave. A merchant who tried to increase his trade found himself punished for his efforts by excessive taxation.

An old peasant voting against Aristides asks Aristides to mark his vote for him.

Solon, a merchant, a philosopher, and a poet, was called upon to put this confusion right. We are told that, "he might have made himself absolute master of Athens, but, being a philosopher, a man of practical wisdom and goodness, he scorned the vulgar ambition of making himself great by enthralling his fellow-citizens." He contented himself with giving to Athens a body of just laws. He did away with the rights of pedigree, and gave graduated power to those who owned property.

But he set the poorest people free to elect their own magistrates, and made of them a final court of appeal in any great matter of justice or politics. Moreover, he abolished the old practice of slavery for debt with its evil results.

Never were any reforms in the history of the human race marked by a greater genius for moderation. Solon changed the whole character of Athenian national life, and laid the foundations on which its future glory was firmly established; and yet no one was dispossessed of his property, and no one felt himself wronged. A mighty change had been worked without revolution or strife. If the democracy of Athens had grown in wisdom and moral goodness, as Solon wished it to grow, it might have resisted long afterward the mighty onset of Rome.

That the Greeks were a martial and a courageous people, as well as seekers of the true, the beautiful and the good, we may see in the history of Miltiades. At the head of only ten thousand men he confronted a host of tyrannous Persians at least ten times as large, and in the great battle of Marathon he saved Greece from the despotism of an Oriental civilization, and so freed Europe to pursue her own life in independence of Asia. Sad, however, was the end of this bold general. Honorably wounded in fighting against his country's enemies, he was accused of using its naval forces for his own ends, and in spite of all his glory, the unyielding justice of the Greek nation put him into prison, where he died of his wound.

Further evidence of the warlike spirit of the Greeks can be found in the glorious act of a Spartan named Leonidas, born before 500 B.C. There came against

Greece the greatest army ever seen on the earth up to that day, an innumerable host of Persians led by Xerxes. The most important pass through the mountains was called Thermopylæ, and the defense of this pass was intrusted to Leonidas.

With a few men he held the entire host of Persia at bay; but a traitor revealed to Xerxes a path over the mountains, and soon Leonidas and his small host were threatened with destruction from the rear. In such a case he might well have laid down his arms. He could not now save his country. No; but he could still serve her. He could set an example of courage, devotion and self-sacrifice which would inspire the Greeks forevermore.

And so he dismissed his auxiliaries, except a few Thespians and Thebans, and with his three hundred Spartans he advanced into the wider space beyond the pass, where he made a furious onslaught on the myriad hosts of the invader. He was killed in the hopeless attack, but the Greeks, lifting up his body, and carrying it to a little hillock in the pass, made there a final stand against the Persians till every one of them lay dead beside the body of their heroic leader.

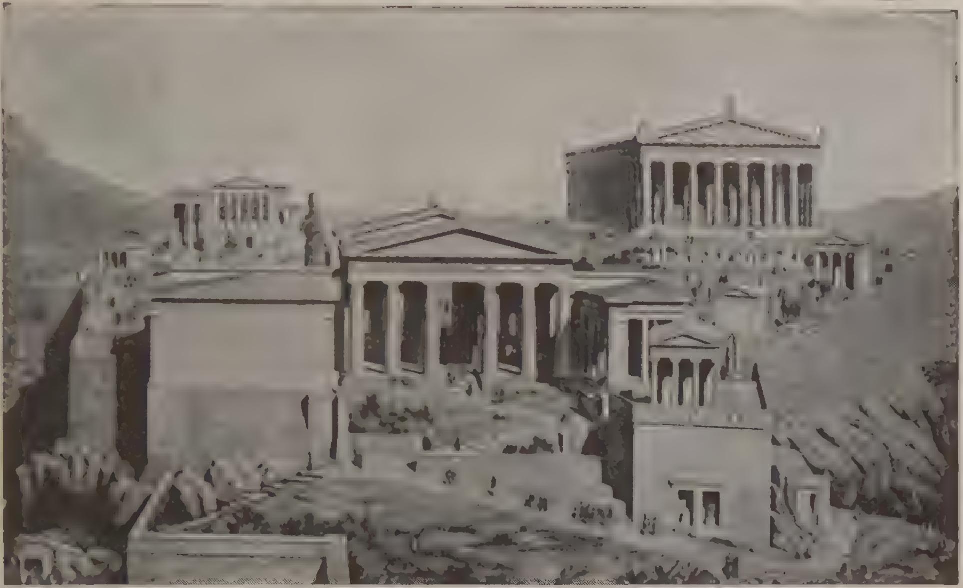
The name of Thermopylæ has passed into the history of mankind. It has inspired heroism of every kind. It is a name which will forever be associated with self-sacrifice. Moreover, it was destined to save Greece from destruction. For the glorious record of Leonidas and his three hundred Spartans, coming to the ears of the Athenians, encouraged their sailors to attack the Persian fleet at Salamis, and to drive it, broken and wrecked, from their coasts. Then followed victory by land, and Athens was saved, the name of Leonidas sounding like a trumpet through the national rejoicings.

Euclid of Megara, a disciple of Socrates, addressing his pupils.

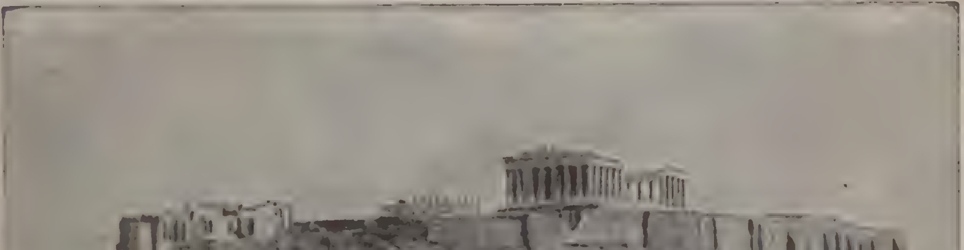
The Athenian fleet had had a strange history. A boy was one day walking by the sea with his father when they came upon some old galleys rotting on the shore. The father, knowing that his son was ambitious, pointed to these old boats left to decay on the shore, and told him that thus did democracy treat its leaders when it no longer had use for them. The name of that boy was Themistocles.

When he grew up, Aristides the Just, a leader of the aristocratic party, was the greatest power in Athens. Themistocles put himself at the head of the democratic party. The rivalry between these two

THE ACROPOLIS, THE GLORY OF ATHENS



AS THE ACROPOLIS MUST HAVE LOOKED IN THE DAYS OF PERICLES



THE MOST SPLENDID RUINS IN THE WORLD—THE ACROPOLIS IN OUR DAY

The upper view shows plainly the positions of the buildings. In the centre, the Propylæa made an impressive approach. High to the right stood the Parthenon, a glorious setting for Phidias' sculptures, and on the opposite side was the Erechtheum with its "porch of the maidens." Near the Propylæa you see to the left the huge statue of Athena, made of bronze taken in battle from the Persians, and a great bronze image of the wooden horse of Troy is represented near the edge of the Acropolis, far to the right.

men forms one of the dramatic situations in history. Aristides was famous for moderation, cautious wisdom and the most scrupulous honor. Themistocles, a man of brains rather than of character, was driven forward on his imperious way by an ambition which never troubled itself about the moral side of a question.

Disagreement between the parties led to open opposition to Aristides. Presently it was proposed that he should be sent into exile. When the people were voting on this question, a man who could not write asked Aristides, whom he did not recognize, to mark his vote for exile. "Has Aristides injured you?" asked the chief magistrate. "No," said the voter; "but I hate to hear him always called *The Just!*"

Themistocles succeeded Aristides. His genius saw that Athens must have a fleet to withstand her enemies and to become the chief power in Greece. He built that fleet, and when the Persians came against Athens, it was the fleet that saved the city from destruction, as we have already shown you.

THE NOBILITY OF ARISTIDES AND THE SHAME OF THEMISTOCLES

To help in saving his country, Aristides, in disguise, made a perilous night voyage through the Persian fleet and sought out Themistocles, offering to serve him, putting aside all rivalry and working only for the salvation of Athens. This noble act gave Aristides a part in the battle of Salamis, and he lived in honor to the end of his days, a poor man uncorrupted by the dishonesty of those times; while Themistocles, convicted of treacherous communications with Xerxes, fled to Persia, and there ended his days by poison. Themistocles was one of the most brilliant men in Athens; but he lacked those great moral principles which are essential to character.

About this time began that marvelous activity of the Greek mind which remains the greatest of Greek glories and fills one of the most splendid chapters in the history of mankind. The Greeks began to look about them and to reflect on what they saw, instead of merely believing what their priests told them. Their genius led them to suspect that the whole mighty universe was governed by eternal laws, and that neither gods nor demons were in charge of the earth and its movements.

HOW PERICLES LIFTED ATHENS TO A GREAT HEIGHT OF GLORY

Among these great teachers were Zeno and Anaxagoras. Both these men became the tutors of a young aristocrat named Pericles. Soon after the death of Aristides this young aristocrat put himself at the head of the democratic party. He was brilliantly endowed, he was the greatest orator in the world, and he possessed a personality which created affection and loyalty. But he was too good and too intellectual to stoop to low arts; and he never flattered the people of Athens, and seldom made speeches, preferring to live a secluded life among the great thinkers of his time.

It is wonderful to read of such a man, for he was a great soldier, a great statesman, a great orator, a great artist and a great thinker. He lifted Athens to a height of glory unequaled in the world; and, having made her strong, he reformed her laws, broadened her justice, increased her prosperity, and covered her hills with glorious buildings which awakened in the citizens a feeling of grandeur and truth.

One of his greatest friends was Phidias, the sculptor, some of whose work still delights people from all parts of the world. He also sought to refine the people of Athens by making them familiar with the work of the great dramatists Æschylus, Sophocles and Euripides, in theatres which were free to all. But one thing Pericles lacked which the barbarous Romans were destined to supply in after-years—a knowledge of sanitary laws. In spite of all its beauty and magnificence, Athens was not protected against disease. One day plague entered this beautiful city, and, laying its hand upon many citizens, snatched away the youngest and most loved son of Pericles, so that the heart of the great statesman was broken, and he himself died soon afterward.

HOW ALCIBIADES RETURNED TO ATHENS IN ITS PRIDE

To the charge of Pericles had been confided at his father's death a youth named Alcibiades. So faithfully and affectionately did Pericles discharge his sacred trust that Alcibiades, growing up in superlative beauty of face and body, has been described as "Demosthenes, Talleyrand and Marlborough, all in one." He had, you see, great gifts; but he had, besides, great self-conceit and was ruled by self-interest. However, men forgave his wild pranks and mischievous acts because of his winning personality. But when, in a great war between Athens and Sparta, he had started to lead an expedition to Sicily, his enemies had him recalled to answer serious charges. Then he fled to the enemy and gave Sparta help and counsel against his own city. After three years he sought to return to Athens, and the call came. Alcibiades now devoted himself to trying to wipe out his disloyalty by some signal service, and for four years he struck at the enemies of Athens until her supremacy was regained. Thus he returned in triumph, and while he was trusted by the Athenians their affairs prospered; but afterward, Alcibiades being superseded in the command of the armies, disaster befell Athens, and Alcibiades was struck down by the darts and arrows of assassins in his fifty-ninth year.

But the glory of Greece continued. The great Socrates had inspired a youth named Plato to search for truth in the mysterious depths of the human soul, and soon Plato was at the head of a school of thinkers destined to change the whole course of human thought. Never had there lived on this earth a man of so far-reaching genius as Plato, and until the end of time all men will search his writings to see to what heavenly heights of imagination the spirit of man may soar. Socrates, Plato and Aristotle, Plato's renowned follower, are a trio of immortals.

Thus Athens became the centre of man's spiritual life, and although Philip of Macedon and Alexander, his son, led their armies to incredible victories, finally subduing Athens herself, the glory of that city continued, and it was acknowledged to be the light of the whole world.

THE WONDERFUL MIND IN THE WEAK LITTLE BODY OF A MAN

Philip of Macedon, who had lost an eye in battle, was a barbarian compared with the Greeks, but he had an iron will, a consuming ambition, and great skill as a soldier. In the midst of his victories he thought of his son Alexander, and gave him for tutor Aristotle, who was second only to Plato in intellect. This Philip, conquering the Greek states one by one, set his heart on conquering Athens, which was the head and glory of the Greek confederacy. In Athens at that time lived a man, Demosthenes, of whom the Athenians said in after-years, "If his body had been as great as his mind, he would have saved his country."

He was the son of a cabinet-maker, who left him a fortune in charge of three trustees. The trustees were false to their charge, and in order to get justice for himself Demosthenes, who was frail and delicate, took his case into the law courts. But on this and on many other occasions his attempts at oratory only excited amusement. His voice was feeble, his gestures were grotesque, his manner was without poise. He would not give in, however, and, practicing oratory in a dozen different ways, and copying out the immortal history of Thucydides eight times till he had its matchless narrative by heart, he gradually made himself the greatest of all Greek orators.

With Philip's victories, Demosthenes put his art to a noble use. He sought to rouse the people of Athens to their danger. He hated the coarse and conquering Philip; he loved the glory and beauty of Athens. Against Philip he hurled oration after oration, giving the world a new word, *Philippic*, which still is used to describe any vigorous personal attack. To the people of Athens he addressed appeal after appeal, calling them to defend their glory and honor from the barbarians.

HOW PHILIP CONQUERED ATHENS AND HIS SON FOUNDED ALEXANDRIA

But, while Demosthenes made speeches, Philip kept at work, and at last the proud city of Athens had to submit to his overlordship. Philip was assassinated soon afterward, but Demosthenes refused to believe the report, saying that if it were true the whole earth would be filled with the smell of his carcass.

It was true, however; but there was no hope for Athens. Alexander, the son of Philip, greater than his father, was indeed one of the greatest men that ever lived; and the soldiers his father had drilled for him were invincible. In spite of bursts of violent passion, in which he committed awful deeds of slaughter, it is true, as Arrian said of him, that "such a man would never have been born without a special providence." His great march into Asia, where the Oriental nations sought to terrify him by bringing huge squadrons of elephants against his foot-soldiers, is one of the greatest adventures in the history of mankind.

ALEXANDER AND HIS INFLUENCE FOR GOOD IN EAST AND WEST

There was a grandeur of romance in his life which no other conqueror ever matched. He was as chivalrous to women as Sir Francis Drake. He used his victories to widen the fields of justice and to enrich human knowledge. The great city of Alexandria in Egypt was his creation.

It has been said that "his zeal for discovery, love of knowledge, and varied accomplishments would alone have made him remarkable"; and the writer goes on:

> His life became an epoch in the world's history as much by policy as by arms. Bringing, for the first time, the East and West into close contact, he acted on the only principle by which races can be moulded together.
>
> Everywhere he diffused some of the blessings of Greek civilisation, opened up new possibilities of progress, and scattered seeds far and wide, to spring up with various degrees of influence over the destinies of mankind.

No man great enough succeeded him, to carry on his plans for India, and that vast country had to wait 2,000 years before European culture touched its shores once again.

There was something splendid in his death. As he lay on his couch, too weak for speech, too ill for hope, his generals came in one after another, grasped his hand, exchanged a glance of the eyes, and went out again into the sunlight. So the greatest conqueror of the ancient world departed from this life in silence, leaving behind him a name that will not die.

THE MEN WHO WISHED TO REST THEIR SOULS ON SOMETHING ETERNAL

But the influence of his tutor Aristotle is greater still. All the marvelous discoveries of modern science trace back their pedigree to the great thinker who went to Athens to study philosophy under Plato, and lived to depart from the teaching of the great master, and launch the human mind on the ocean of the positive sciences. Before his time men had guessed this and that about the universe. Aristotle was not content with guessing. He set himself to examine the things of nature that he might arrive at the rational law which governs the universe.

As we look back to those ancient days, it is easy for us to see that no warrior like Leonidas, no conqueror like Alexander, no statesman like Pericles, and no orator like Demosthenes could serve humanity so truly and so eternally as Socrates, Plato and Aristotle. These men followed Greek genius. They were not concerned with passing matters like empires. They wanted to rest their noble souls on something eternal. Socrates discovered that the inner life of a man is the thing that matters to him most. Plato discovered that the soul comes from God and is itself divine. Aristotle discovered that the world is a vast treasure-house of entrancing mystery into which the reason of man can enter and find knowledge.

With the reign of Alexander the political glory of Athens came to an end. Nevermore were men to look on that lovely city as the seat of a sovereign power. Yet it continues to this day as a city of sacred memories, and its true glory, instead of diminishing, increases with the ages.

Let us think back over a few Greek names which are known and honored by all civilized mankind.

CREATORS OF CIVILIZATION WHO THOUGHT THEMSELVES INTO IMMORTALITY

First let us set down the great name of Homer, the father of all poetry, in whose majestic lines the earliest history of the Greeks is eternally preserved. Then Socrates, the apostle of the honest man, the enemy of all cant and dogmatism. After him, Plato and Aristotle, the two greatest thinkers in the history of the human race. Then, among men of imaginative genius, Æschylus, Sophocles and Euripides. Then, among men of scientific genius, Hippocrates, Galen, Thales, Euclid and Archimedes. And, finally, among the historians, biographers and tellers of stories, Hesiod, Herodotus, Thucydides, Xenophon, Plutarch and Æsop the slave.

What a noble array it is! Remember, these men were not the heirs of a great civilization but its creators. They lived before the birth of Christianity. Slavery was tolerated in their day. Religion was superstition. Medicine was magic. The mass of men were stupid, ignorant and brutal. There was no printing or machinery. A journey was made on foot or on horseback. And war was forever hammering at their doors.

Yet these men thought themselves into immortality. With fewer outside things to distract their minds from that inward life, which is the only true life of all of us, they so enriched their souls that they were far happier and infinitely more intelligent than most millionaires of this modern world, and were able to show the way to all those who, coming after them, have loved truth, beauty and goodness.

THE MATCHLESS BEAUTY OF THE POETRY OF OLD GREECE

In defending the language of Greek poetry, Professor Gilbert Murray speaks of its quality of *keen austere beauty,* and says that it has this quality because those who used it were toned to a higher level of intensity and nobility than ours. "It is a finer language," he says, "because it expresses the mind of finer men"; and he goes on to say:

> I mean men to whom the fine things of the world, sunrise, and sea, and stars, and the love of man for man, and strife, and the facing of evil for the sake of good, and even common things like meat and drink, and evil things like hate and terror, had, as it were, a keener edge than they have for us and roused a swifter and a nobler reaction.

Commercialism had not then invaded the sacred places of the soul. Men felt themselves to be living in a universe most majestical and most beautiful. They were conscious of wonder and reverence. From the terrors that fastened on their minds by the superstitions of savagery and barbarism they arose with courage and dignity, but with reverence and gratitude, to investigate the laws of nature and speculate on the purposes of God. So marvelously near did they approach to the truth of the universe that it was not until Christianity came into contact with Greek thought through St. Paul that it separated itself from Jewish racialism to conquer the Western world and create another civilization.

In this respect let our last glance fall upon a Greek whose teaching blended with Christianity, and who kept alive in Rome the tradition of Greek thought until he was expelled by Domitian.

Epictetus was a Stoic, and lived in a doorless hut with no furniture but a lamp. All around him was skepticism or blank atheism. Men of little minds had twisted the teaching of Plato and Aristotle to mean that of one thing only could the mind be certain—that it was certain of nothing. And there was even a school of thought whose motto was, "Eat, drink, for to-morrow we die"—a school which reduced men to the level of beasts.

The noble Epictetus taught men a more reasonable faith. In him the light returned to the mountains. He divided the life of man into two parts. In the one part were all those things which are within our own power—our thoughts, ideas, wishes and desires; in the other part were those things beyond our power—our bodies and our possessions. God who governs all things decides on our bodies and our possessions, but we are responsible for our ideas and desires.

A mosaic of the defeat of Darius by Alexander, recovered from Pompeii.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 859.

NEWFOUNDLAND AND ST. BERNARD DOGS

The great Newfoundland dog was so called because it originally came from the island of Newfoundland, though very few are now found there. It was used by the fishermen to draw little carts, just as dogs now do in Holland, and shared good times and hard times with its masters. It is a very intelligent and faithful animal. The dog in the picture was painted by Sir Edwin Landseer, a well-known animal-painter.

The most famous dogs abroad are the St. Bernards, the powerful creatures which live in the Alps and are trained by the monks at the monastery of St. Bernard. When a snowstorm occurs in the mountains these dogs go out, with a little flask round their necks, and seek travelers who are lost in the snow.

Photos in these pages, by Charles Reid, Lewis Medland and Ernest Landor.

Eskimo dogs, from the painting The End of the Trail (copyrighted) by Miss Maud Earl.

THE FRIENDLY DOGS

CONTINUED FROM 603

IT was an important event for the human race when one of the wild men of old went into the wilderness, captured a creature with twice as many legs as his own and twice the speed that he could command, tamed and trained it, and so started an everlasting partnership between mankind and the brutes. This domestication of the wild dog did not take place in a day. Indeed, many generations of men and dogs must have passed before the newly acquired four-footed companion became of any service to its masters.

Man lived by tracking, trapping and killing. In the wolf or the jackal, which was to become his dog, he found a fresh addition to his powers. The friendly dog became new ears, new nose, new eyes to him, and so doubled and trebled the forces which discovered and led him to his quarry.

Moreover, we know from primitive peoples still living after the fashion of our ancestors that the dog early became a living weight-shifting power. The Eskimos with their teams of sledge-dogs, the Tibetans with their caravans of dogs crossing the mountains with packs of merchandise on their backs, point out to us the ways of primeval man. They moved loads of dog-drawn property when wheels were as unknown to them as they are to the Laplanders to-day.

By a sort of free and easy enslavement of an animal early man was able to live much more easily. He became an owner of living things, with duties and responsibilities to dumb creatures. The need to keep his ally healthy and vigorous for the chase and for hauling, made man think, made him considerate and kind in a rough way to animals. Care for brutes helped to civilize the untutored savage who won the affection of the first dogs.

Which was the first dog? It was none of the species that we now know as wild dogs. Differences of structure show us at once that it was none of these. And it was not the fox. There remain the wolf and jackal. They are probably the source from which the dog we have comes to us.

It may be that we have dogs tracing back entirely to wolves, and dogs tracing back entirely to jackals. The Eskimo dog is practically pure wolf; so is the wolf dog of Florida; and the line of descent of the Alsatian wolf dog is clear. Dogs owned by American Indians are scarcely to be distinguished from the coyotes of the prairies, but the dogs of Southeastern Europe seem only tamed jackals.

The probability is that the blood of wolf and jackal mingles in most of our fashionable breeds of dogs, and that only the tamed animals of savages and semi-wild peoples remain full-blooded modifications of wolf in one area, of jackal in another. There is no strain of alien life in our dogs. Wolf and jackal have yielded us all the varieties we have.

The tiny pet of the boudoir spoiled by unnatural luxuries; the giant mastiff or St. Bernard which lords it over a patrician courtyard; the dog which guards the poultry or the flocks, which saves us from drowning in rough seas, or keeps the burglar from the house—they are all the posterity of wild hunting beasts that tore other creatures to pieces or gorged with ecstasy on the carrion which their keen noses found them.

TWO HUNDRED BREEDS OF DOGS FROM ONE OR TWO ORIGINAL STOCKS

With this limited store to draw upon, man has done marvels. We know that many breeds of pigeons have been developed from the single parent stock, the wild rock pigeon; that many varieties of poultry have been created from the wild jungle fowl; but the man who has studied dogs by careful selection can point to nearly two hundred breeds from one or two original stocks.

Perhaps the dog most disliked of all dogs is the semi-wild Australian dingo, the dog that does for sheep what the rabbit did for pastures. It has always been regarded as a modern introduction into the island continent, because it is the only highly developed flesh-eater in a vast land. There all other animal life has remained at the stage to which it had advanced throughout the world thousands of years ago. A recent discovery shows the dingo as an ancient aristocrat of Australia. In 1884 fossilized remains were found, washed out by a flood from their age-old grave seven or eight feet below the surface of the ground, at Talgai, on the Darling Downs of South Queensland.

THE PRICE ON THE HEAD OF EVERY DINGO IN AUSTRALIA

Man and these creatures lived together in Australia so long ago that we cannot even guess the time that has since elapsed. We can only put the time in geological language, and say that the period was when Europe was covered with ice. Professor Wood Jones of Adelaide University believes that between that far-away invasion of man and modern times no man reached the Australian mainland until Captain Cook visited it.

For ages the dingo had been free in Australia, living upon small game and doing no harm. But white men arrived and brought sheep, and the sheep multiplied. They proved easy prey and good food for poor dingo. Dingos, receiving a new impetus from this fresh source of nourishment, have increased rapidly and have become the chief foe of the flocks. To-day there is a price on every dingo's head.

That is ever the case when tame dogs run wild. In our own country they kill sheep. Abroad they rival the jackals as scavengers and thieves. In the vicinity of wolves they take up the life and liberty of those dreaded animals. Left to themselves, all the pets of our homes to-day would become as wild as the dingo.

THE MANY QUALITIES WE FIND IN ALL KINDS OF DOGS

There is no danger of this happening in civilization, where the dog stands first of all animals in our affections. The tendency is to increase the number of the breeds. This is done by preserving those of distinctive shapes, sizes, markings, type of coat, and so on, or by crossing.

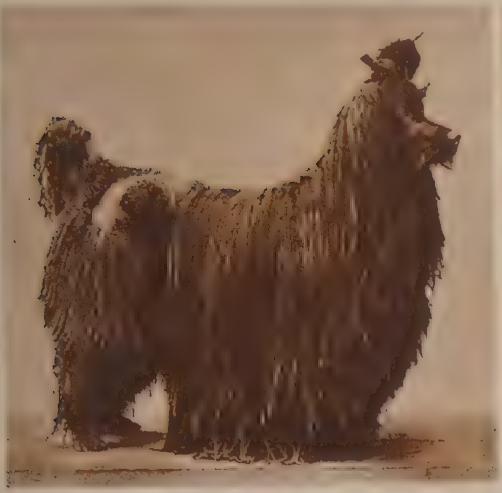
The result is that we have fashions in dogs as in clothes and shapes of motor cars. The favorites of the day are soon neglected. To-day's favorites may be the Alsatians among big dogs, the Pekingese among small ones, the pointer and setter among sporting dogs. Formerly we had tiny schipperkes, pugs, poodles, Dalmatians, various minute spaniels, and all sorts of little terriers. To-morrow a new variety will arise, like a new flower or a new fruit, to become the rage.

All sorts of qualities are treasured from time to time—speed and staying power, indolence and placid home-contentment; ferocity and strength for fighting; gentleness and fidelity for the boudoir. The one thing that men have seldom sought to breed in dogs is intelligence.

In spite of this the dog brain is a fine natural instrument. Which is the most intelligent dog in the world? That is known to every one of us who loves a dog. The most intelligent dog in the whole wide world is our own!

Scientists quarrel as to whether the dog has any reasoning powers. Let them quarrel. All of us who have grown up with dogs, have been taken out as children and led about by them, who have been saved from injuries and from drowning by them, have been tricked and deceived by their cleverness, have been

A KENNELFUL OF DOGS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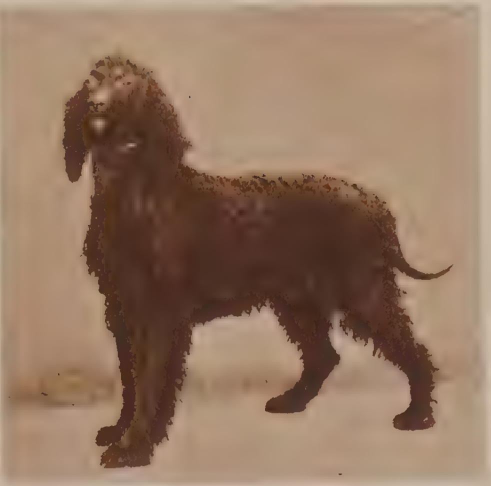
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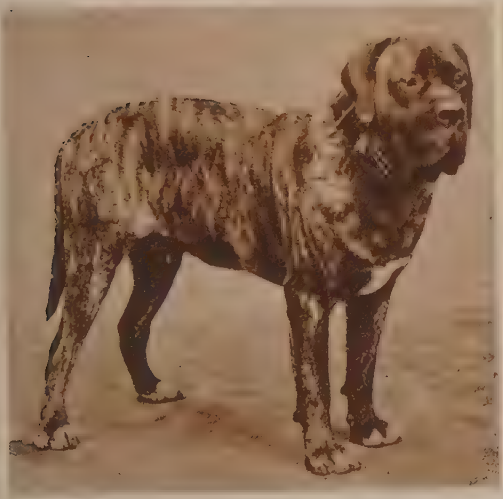
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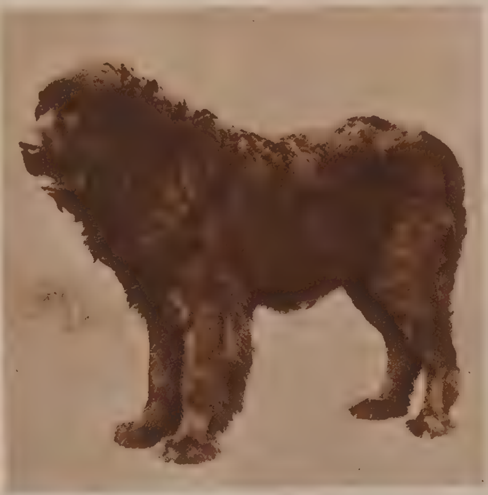
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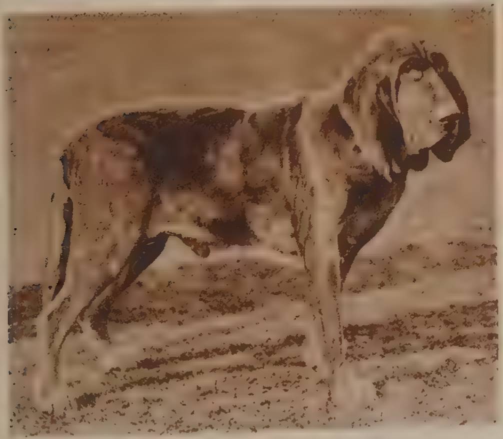
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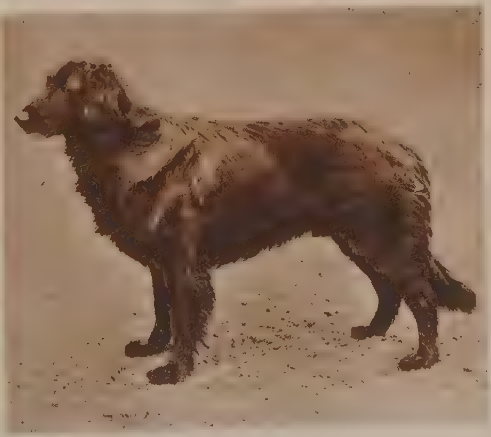
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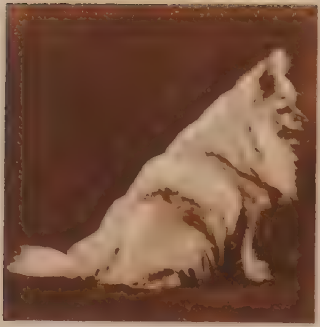

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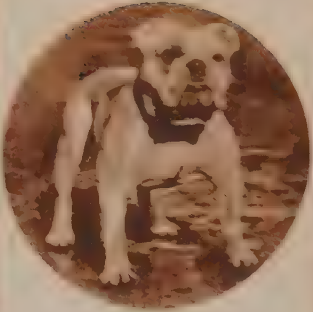
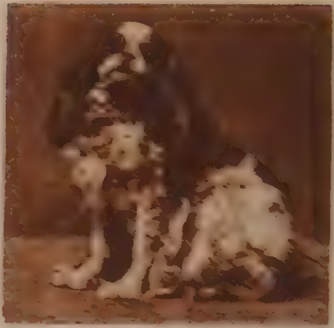


BULLDOG



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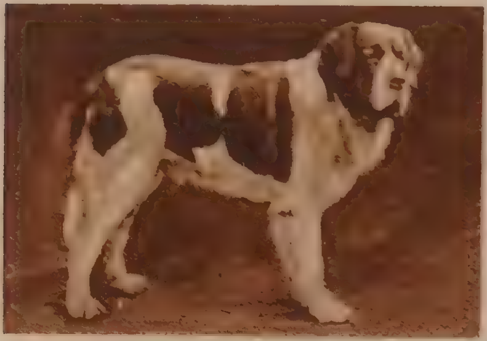
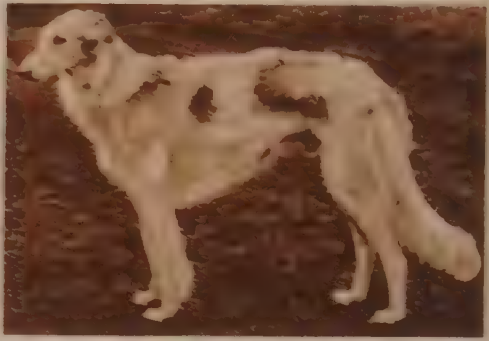
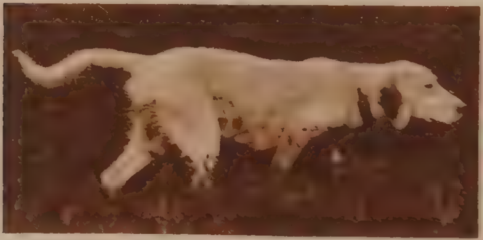


ST. BERNARD



BORZOI, OR RUSSIAN WOLFHOUND



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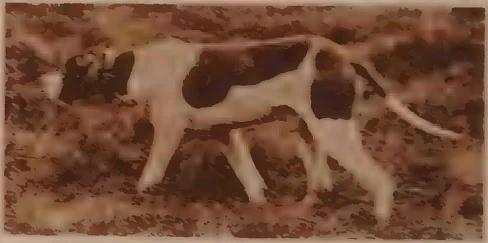

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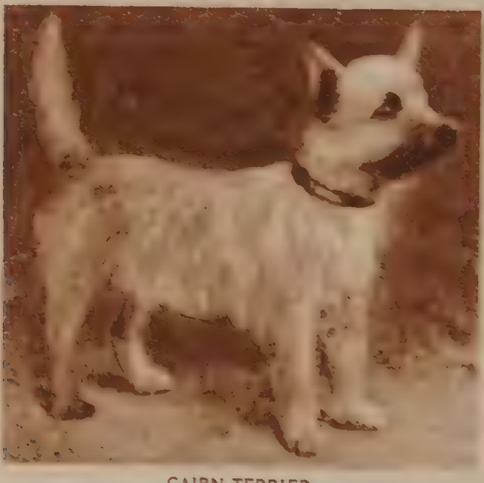
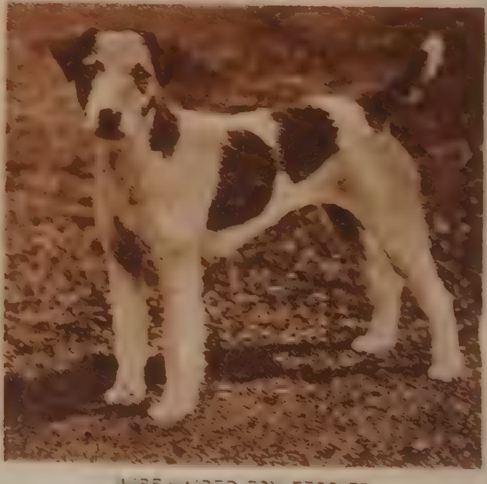
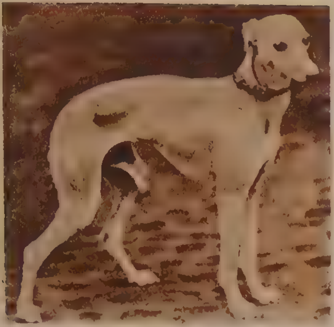


CAIRN TERRIER



WIRE-HAIRED FOX TERRIER



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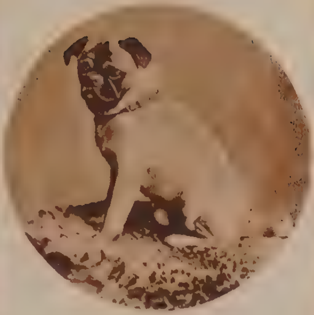

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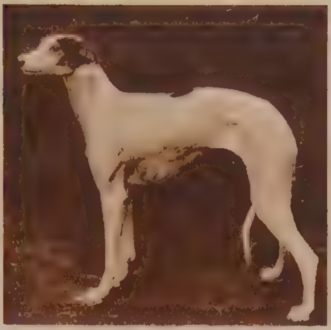

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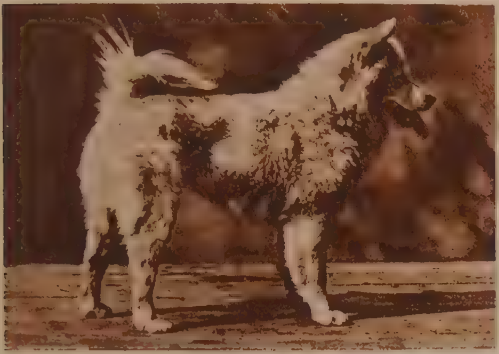
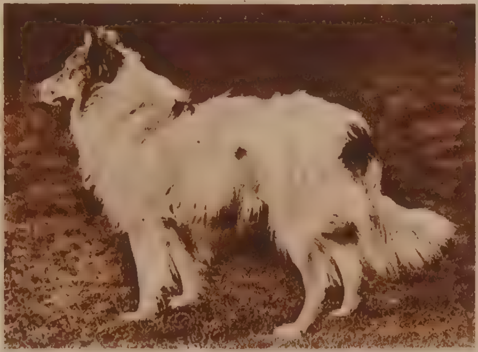
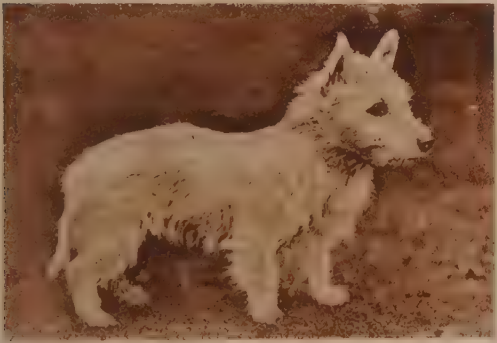


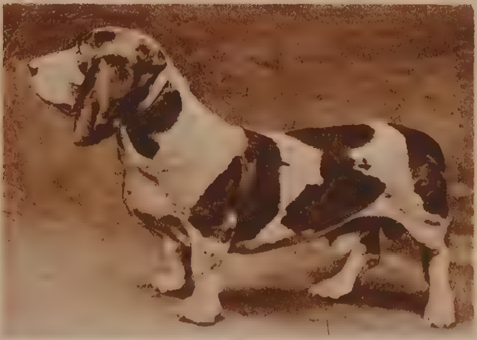
CHOWCHOW



COLLIE



WEST HIGHLAND WHITE TERRIER



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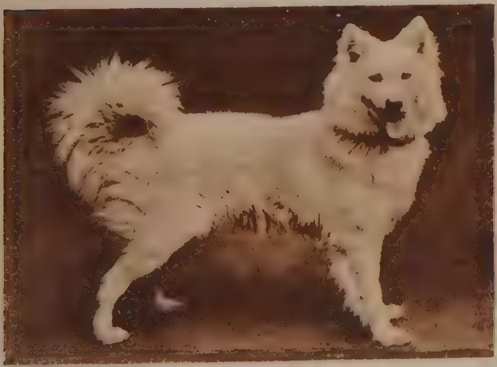
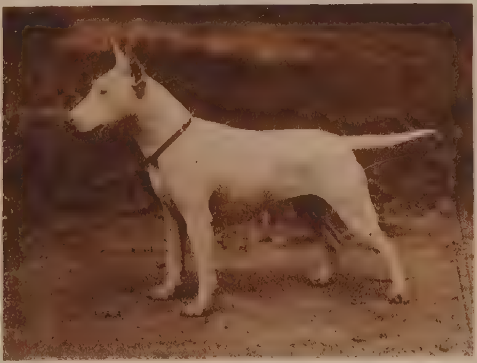
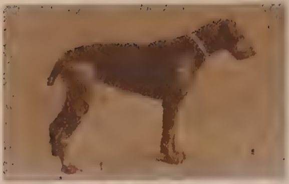


SAMOYEDE



BULL TERRIER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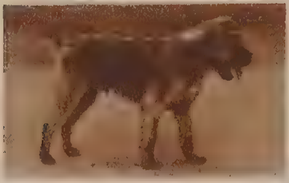
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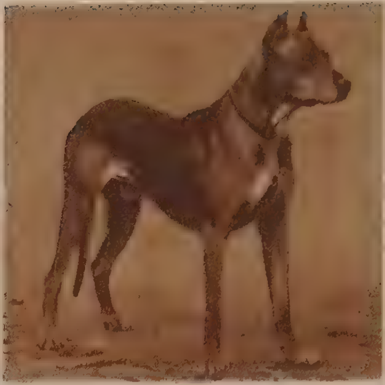
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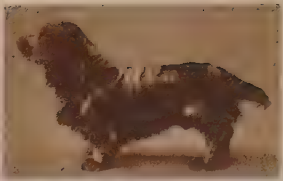
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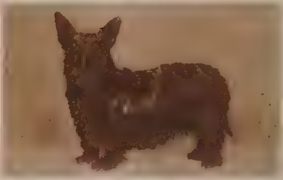
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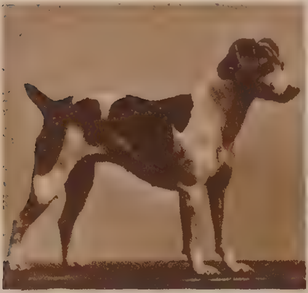
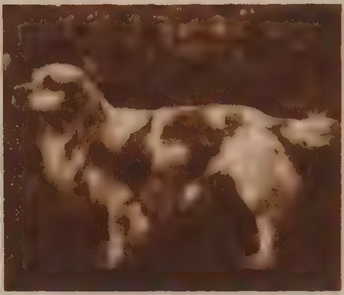

SMOOTH-HAIRED FOX TERRIER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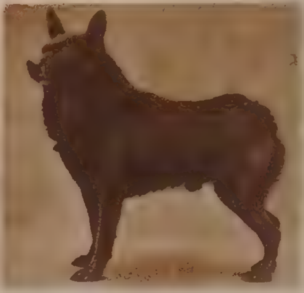
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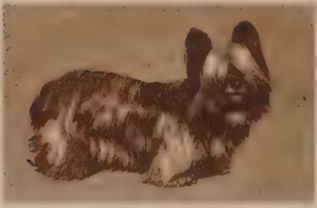
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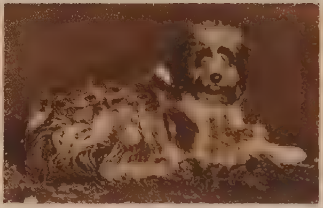
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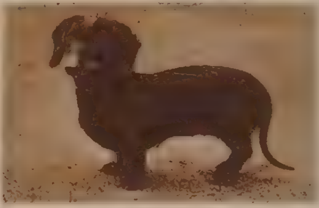
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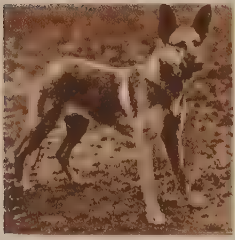
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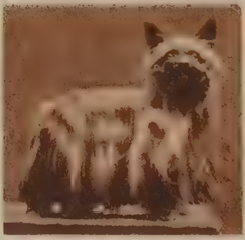
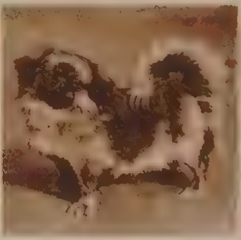

YORKSHIRE TERRIER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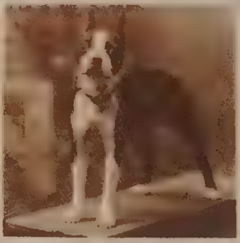
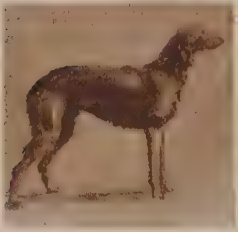
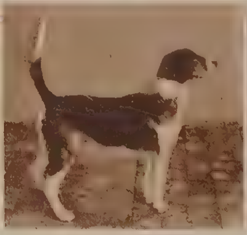
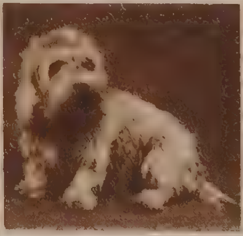
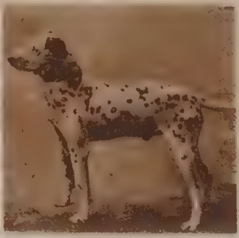

BOSTON TERRIER


DEERHOUND


FOXHOUND


DANDIE DINMONT


DALMATIAN

loved and worshiped and benefited by them—we feel that we know.

Whatever we call it, dogs have a mental quality that enables them to do things that no quite unreasoning animal could do. Two terriers belonging to Mr. Frederick Nutt, the bookseller of Clement's Inn, London, were accustomed to play about the entrance to King's College Hospital when it was in the Strand. They saw a strange collie run over in the road, assisted it to the hospital door, and barked until they were all let in where the sufferer could be treated.

SOMETHING AKIN TO REASON AT WORK IN THE DOG'S BRAIN

How are we to account for that? Mr. Nutt gave his opinion in these words: "The dogs were accustomed to see injured patients carried into the hospital. They themselves never went in, but they somehow grasped the meaning of those visits by injured people on stretchers. By some unfathomable process of thought, when they saw a stranger of their own kind also in distress, they led him to the help which they realized others received at the hospital."

The explanation is not scientific; it may be full of flaws, but science has none more plausible to offer. The incident is commemorated in an oil painting hanging in a hospital room. Doubtless the Governors would not scorn the theory built up by the owner of the two delightful terriers that are the heroes of the picture.

Perhaps we have seen a dog who wants the chair in which its master sits, run to the door as if to get out. When its master got up to open the door, it darted back and seized the empty chair with delighted barks. We feel that something akin to reason must have been at work in that little brain. When we see the marvels that are performed by dogs in shepherding sheep—turning so many to the left and so many to the right, driving them gently round obstacles, penning them, letting them out, identifying one familiar sheep and bringing it out from a flock of strangers—we know that training has made the wonder possible. But what are we to say of the animal mind capable of such an education?

SIX GROUPS OF DOGS FROM WHICH ALL THE REST HAVE SPRUNG

Intelligence and ability to receive instruction have made dogs the friends of man. If only they had been bred for intelligence! They have not, so let us glance rapidly at some of the results of the practices that have for ages been followed. The result has been to fix six groups of dogs from which all the rest have sprung. These are they: wolf-like dogs, greyhounds, spaniels, hounds, mastiffs, terriers.

Some of the relationships are a little surprising. The Eskimo dogs, which draw the sleighs, like the lusty heroes which take the mail to snowy Alaska, are obviously more or less polite wolves. But it is startling to know that the big Pomeranians, wolf-hunters in old-time Germany, come next, with the tiny Poms of the drawing-room as their smaller brethren. And in the same group come the delightful schipperkes, owning as close kindred the handsome but rather sharp-tempered chowchow of China.

What a range of life that covers. A handful of fish or offal, a piece of stolen harness, or the body of a dead comrade is the meal of the wolf-like Eskimo dog, which took Peary to the North Pole and Amundsen to the South Pole. At the other end of the line are the spoiled Poms for whom no food is too dainty. The hard-working, handsome collies and sheep dogs are in the same collection—all sons of wolves, as far as we know. It is hard to believe, but such ancestry is theirs.

THE RUSSIAN BORZOI THAT WILL TACKLE A STOUT WOLF

The greyhounds, fleetest of dogs and among the least intelligent, are unique, not only for their speed, but for hunting by sight. Ordinarily dogs track by scent. Not so these speed machines. They are the result of intensive breeding, they and their Italian whippet cousins.

Related to them is the Scottish deerhound, stouter and coarser of hair; the ancient Slughi of Persia; the long-haired Afghan greyhound; and distinct breeds from Greece, Albania and elsewhere. Next comes that beauty the Russian borzoi, over thirty inches at the shoulder and a match for a stout wolf. It was dogs from the breeds in the present group which figured in the life of the Pharaohs and were carved upon Egyptian monuments.

Merely noting the existence of unpleasant hairless freaks from China, Central and South America, we pass to the spaniels. Of this breed the famous ones are the clumber, the Sussex, the Norfolk and the cocker spaniels. The King Charles and Blenheim spaniels are small varieties of the cocker breed.

The normal spaniels all have some taste for the sports of man, and will find game and pick it up when it has been shot. But the little Pekingese, which are Eastern spaniels, do not share the common habits of the breed. How should they, after generations of foolish pampering?

Setters, which find game and then stand rigid over it, are specialized spaniels. The retriever, fine in the water as well as on land, is also a spaniel, and so is the noble Newfoundland. The Newfoundland is without comparison, as a breed, as the savior of lives in the water, but one has known an untrained curly retriever just as brilliant, clever, and courageous a water-dog as any Newfoundland.

THE HOUNDS THAT USED TO TRACK DOWN MEN

Next come the hounds, with the bloodhounds at their head. They have lost their fierceness, we are thankful to say, as trackers of men. Once they did track, and tore when they found their man. That quality has been bred away, and the modern bloodhound does not, as a rule, attack the person whom it is set to find.

The feats of the bloodhound result from fineness of nose. But it is doubtful if its scent much excels that of its kindred the foxhounds, which hunt the fox entirely by a scent that soon evaporates. Harriers and beagles, which hunt hares and rabbits, have the same faculty. Otter hounds have keen noses, as well as woolly coats to keep out water when pursuing their quarry.

Dachshunds, big and little, are badger-hunting dogs at home in their native Germany and are keen of scent. Pointers also are famous for their noses, but instead of following the trail left by the feet of the quarry, as the foxhound does, they detect victims by body scent, which rises higher in the air. The old "plum pudding" Dalmatians, now nearly extinct, are hounds, and so are the uncommon griffons.

Mastiffs include not only mastiffs proper, but the Great Dane, or German boarhound—biggest of all the dog tribe except the Alaskan wolf. One of the true mastiffs is English bred; another is a Cuban variety.

In this breed come the bulldogs, now a declining race. They were bred to fight bulls and other animals, and fortunately their occupation is gone. So, nearly, are the dogs, both bulldogs and bull-terriers—rather stupid animals—whether English or French, though with brilliant exceptions. A nice ugly bulldog can be the most lovable of creatures, but there are others that are not so friendly.

THE GALAXY OF TERRIERS THAT WE HAVE TO CHOOSE FROM

Two of the finest dogs, the huge wolf-fighting Tibetan dog, which guards the native villages, and the noble St. Bernard, long the hero of rescues of lost wanderers in the snowy Alps, all but complete the mastiff group. The plump and gasping pug is also a mastiff, little and freakish.

The terriers remain, very near to our hearts. Some of them, whether they guard us from rats and mice, or share our walks and hunts, become partners of the study and dining-room; others remain faithful to their posts in the garden, kenneled, but not chained, we hope.

No one need lack a favorite with such a galaxy to choose from: fox terriers, smooth and rough; Irish and Scotch terriers; the Skye terrier with drop ears and smooth coat; the Skye terrier with prick ears and rough coat; the Yorkshire terrier with hair three or four inches long on the body; the black-and-tan terrier; the tiny toy terriers; the little griffon; the clever poodle; the sturdy Airedale; the Maltese; the Boston; the Mexican lap-dog—a breed for everyone.

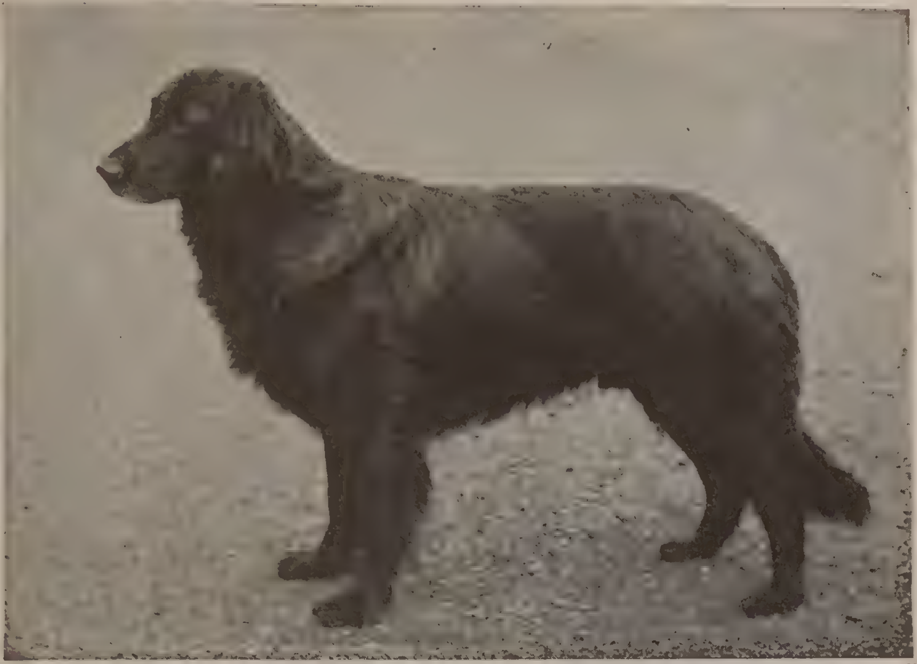
THE GOLD OF AFFECTION THAT OUR DOGS NEVER LOSE

There is something to admire and grow fond of in each. Every dog has its faults and commits its follies, but when did ever one betray its master or mistress? When did the affections of one ever grow cold? We have done much for and with dogs, but they brought in with them from the wilds a nature whose savagery was redeemed by a vein of pure gold.

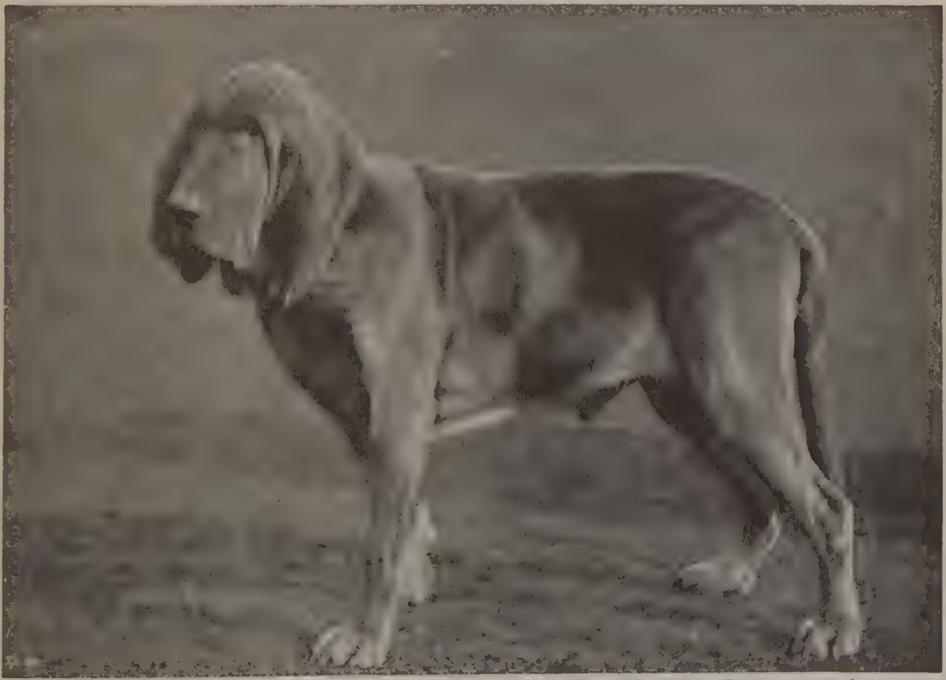
Boys and girls who possess dogs know that there is no better companionship than that of these shaggy dumb friends. And there are times when our dogs seem to understand and love us as much as, or more than, our human friends.

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 865.

TWO STRONG AND BRAVE DOGS THAT HUNT WITH MEN

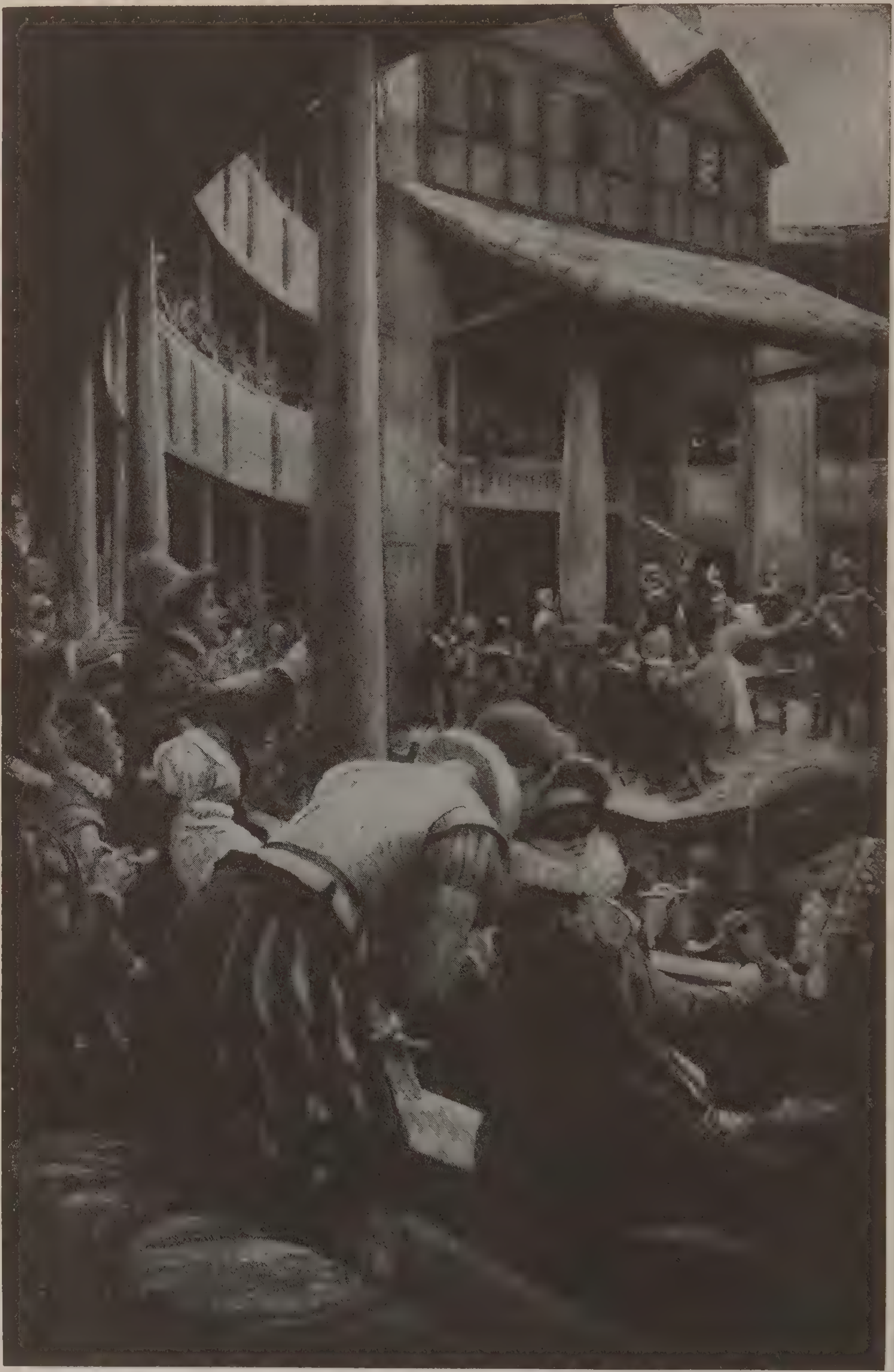


The retriever is a most useful dog. It was the skill of this dog that led men to train it. It is generally very clever at fetching and carrying things for its master. The writer of this story had one of these dogs, which used to come and meet him. If his master were not going home he would place a note in the dog's mouth, and the animal would then run home and deliver the note, and afterward return.



The bloodhound was formerly used for tracking game which had been wounded. It has a very keen nose, and can follow a scent for miles. Its keenness was made use of for tracking men who had committed crimes, and even in our own day the police find it very useful in assisting them to hunt down criminals.

THE THEATRE WHERE SHAKESPEARE SAW HIS PLAYS



A performance in the Globe Theatre, Southwark, where Shakespeare himself acted.

William Shakespeare with some of the great men of his time.

A SHINING SPLENDOR COMES

CONTINUED FROM 480

THE most famous Englishman of all ages, William Shakespeare, poet and dramatist, gained his fame not by deeds of heroism but by hasty writings which he did not preserve with any care. Through his natural genius, English literature in its choicest forms burst almost suddenly into its brightest splendor.

The chief form of writing used by Shakespeare was the drama. But the English drama, as we now understand it, had only been invented during the lifetime of Shakespeare's father. The first English comedy, called Ralph Roister Doister, was written for a company of boys by Nicholas Udall only eleven years before Shakespeare was born; and the first tragedy, Gorboduc, by Thomas Sackville and Thomas Norton, was acted in the Temple only three years before Shakespeare's birth.

So short was the period from the time when there was no English drama to the perfection of dramatic art. It was an outburst of intellectual energy at which the world has wondered ever since.

Long before Shakespeare there had been acting of a rude kind in England. At first under the supervision of the Church and later by the guilds of workmen, the so-called Miracle plays, representing Scripture scenes and lives of the saints, were given and also versions of romantic traditions, like Robin Hood's adventures. They were followed and accompanied by Moralities, in which the characters were not human beings but Virtues and Vices, with comical *Interludes* thrown in to raise a laugh. These merrymaking scenes have left us relics to this day in the clown and harlequin.

We know quite well what the Miracle plays, Moralities and Mysteries were like, for numerous examples have been preserved, as in the forty-nine Mysteries of York, thirty-two of Wakefield, and twenty-five of Chester. Though they created an interest in a rough form of acting, in days when reading was comparatively rare, they were not real plays, but were rather tableaux connected by rhymed talk.

The first theatre was built near London when Shakespeare was twelve. None was allowed in the city itself till many years had passed. With the theatre came professional actors and professional writers for the stage. The first group of them were men ranging from ten years older than Shakespeare to his own age. It was these men, John Lyly, Thomas Nash, Thomas Lodge, George Peele, Robert

Greene, and, above all, Christopher Marlowe, who first began to write true plays. They were known as the University Wits and were the real preparers of the ground for the work of Shakespeare. They were men whom he knew and who knew him.

THE DAWN OF A NEW AGE OF SPLENDOR AND ROMANCE IN LITERATURE

"The spacious times of great Elizabeth," from which Shakespeare rises as a lasting king of men, were great in changeful wonders. Only the opening years of the twentieth century, when air flights and wireless telegraphy brought all parts of the earth close together, can be compared. But these later discoveries, which are but forms of swiftness, do not mean so much as the changes in the time of Shakespeare. A number of new prospects lately unfolded then spread wide and fair before the gaze of men, and made them feel how good it was to be alive.

The whole round earth had become vaguely known, and it was felt to be rich in romance. The charms of the ancient life of Rome and Greece were breaking through the mists of ignorance that had clouded the Middle Ages. Printing was spreading throughout Europe tales of all other countries gathered from long vistas of time. And, above all, the minds of men were being freed to think as they would about whatever concerned their welfare and happiness. The English language, too, had become rich in words that would express all thoughts and feelings. "Lo, Creation widened in man's view," and records of mind-stirring thought were pouring in upon the nation through translations from other tongues.

THE GLOWING GENIUS OF THE STRATFORD TRADESMAN'S SON

What was needed was a man who could gather up and record the vast interest in life felt by these alert, quick-minded Elizabethan lovers of the romance that came surging afresh over the world. Who could that man be? How could he find an adequate form of expression? Would he be a man packed with learning and writing history, grave and gay? No. He was not that kind of man at all. He did not write in that way. He chose the new style of writing plays—the drama—as his method of expression, molding it to suit his purpose. The knowledge he had he was obliged to find in English; in translations if it came from foreign sources. He was an English country youth, who in his early twenties went to London and became an actor; a tinkerer and improver of plays by the University Wits; then a writer of plays written around borrowed plots; then a writer of lively comedies, of splendid histories more fascinating than all the books of history; of delicious poetical fantasies, of sweet romances, and of noble, heart-moving tragedies. He pictured all the romance of life, past and present, as if it were being lived again before the eyes of the people of his day, and of all who follow after. Also he was much more than a mere writer of plays. Woven into his plays are the proofs, in haunting words, that he was a profound thinker and a poet for every mood.

It was William Shakespeare, the Stratford trader's son, who at first, when he came among them, was sneered at by the University Wits as "an upstart crow beautified with our feathers." Yet he so ministered to the Elizabethan mind in the plays he wrote that his great friend, Ben Jonson, hailed him as "not of an age, but for all time."

THE POEMS THAT BROUGHT WILLIAM SHAKESPEARE HIS FIRST FAME

Why was Shakespeare so careless about his plays, which the world now thinks are supremely great? Why did he apparently think more about his poems, Venus and Adonis, Lucrece, and his Sonnets? We shall understand if we realize that poems based on Old-World myths and stories were fashionable. They were supposed to be the kind of writing in which poets should excel. Shakespeare, by writing them, proved that he could write the poems that were in fashion better than the best. As a poet he gained his earliest fame.

On the other hand, plays, though popular to see, were not rated so highly as poems in literature. Indeed, that is still true, unless the plays are great in thought and feeling. Besides, Shakespeare had revised many plays by other men, correcting something here and adding something there, and how was he to claim these as his own? So, of the thirty-seven now attributed to him, only sixteen were published in his lifetime. Yet it is the plays that establish his greatness and contain his very choicest poetry.

To the plays we shall come in due course; here a glance must be given to the poetry which he gave to the world as poetry.

The Venus and Adonis and the Lucrece

are interesting to us now only as fashions of verse that have passed away. They show Shakespeare's mastery of flowing rhyme and echo his early acquaintance with animal life in country surroundings. In Lucrece there are some passages of fine writing on serious themes of a kind that the people of his time greatly admired. Even in the plays of the period it was expected that now and then a chief actor would recite impressively an eloquent passage as a soliloquy—that is, as a man might talk to himself while he was thinking deeply.

The fine reflection beginning, "To be or not to be," in Hamlet, and the pleading beginning, "The quality of mercy is not strained," in The Merchant of Venice, are instances; and in the same way we find in Lucrece the three stanzas on Time which show how thoughtfully the poet was writing before the years when he produced his greatest works. He gives more than twenty illustrations, most of them in a single line, of the slow power of remorseless Time.

An evening at the Mermaid Tavern, where Shakespeare and Ben Jonson used to meet.

Time's glory is to calm contending kings,
To unmask falsehood and bring truth to light,
To stamp the seal of Time in aged things,
To wake the morn and sentinel the night,
To wrong the wronger till he render right,
To ruinate proud buildings with thy hours,
And smear with dust their glittering golden towers;
To fill with worm-holes stately monuments,
To feed oblivion with decay of things,
To blot old books and alter their contents,
To pluck the quills from ancient ravens' wings,
To dry the old oak's sap and cherish springs,
To spoil antiquities of hammered steel,
And turn the giddy round of Fortune's wheel;
To show the beldame daughters of her daughter,
To make the child a man, the man a child,
To slay the tiger that doth live by slaughter,
To tame the unicorn and lion wild,
To mock the subtle, in themselves beguiled,
To cheer the ploughman with increaseful crops,
And waste huge stones with little water-drops.

In these verses there is a poetic vision of impressive happenings put into a few wonderfully chosen words that must have convinced all readers that a great poet was among them. And the Sonnets were more haunting still.

Many books have been written on Shakespeare's 154 Sonnets, with the object of showing who the people were about whom he wrote these poems—the two men who were his friends, and the woman whom he loved and who deceived him; but the books do not prove much either about Shakespeare or the friends he claimed to be making immortal by his descriptions of them. The explanations are nearly all guesswork, and it is better to read the Sonnets as poems of varying quality, and not as forming a complete scheme or plan.

EXQUISITE BEAUTY AND SWEETNESS OF SHAKESPEARE'S SONNETS

Many of them are exquisitely beautiful, with a cadence that haunts the mind, and imagery enchanting in its sweetness and simplicity. They set a standard by which great poetry may be forever judged. They were written comparatively early, before the poet had reached thirty, and full twenty years before he died, old at fifty-two.

Though now we have no interest in these people in flattery of whom Shakespeare wrote his Sonnets, he wove into them such phrasing and such thought as will preserve the Sonnets fresh as long as the English language is read. It was a whim of poets of that time to suppose their verse was preserving remembrance of the people they enshrined in verse, but when Shakespeare said the same thing he prefaced it with lines like these, which made the boast true.

Shall I compare thee to a summer's day?
  Thou art more lovely and more temperate;
Rough winds do shake the darling buds of May,
  And summer's lease hath all too short a date.
Sometime too hot the eye of heaven shines,
  And often is his gold complexion dimmed,
And every fair from fair sometimes declines,
  By chance, or Nature's changing course untrimmed.
But thy eternal summer shall not fade,
  Nor lose possession of that fair thou owest,
Nor shall death brag thou wander'st in his shade,
  When in eternal lines to time thou growest.
So long as men can breathe, or eyes can see,
So long lives this, and this gives life to thee.

The personal aspect of these sonnets is lost in their beauty, in the sounding of the depths of thought, and the picturing of nature's fairness with matchless art. Such phrasings as "the prophetic soul of the wide world dreaming on things to come," are indeed everlasting possessions. So are splendid lines like these:

When to the sessions of sweet silent thought
I summon up remembrance of things past;

such descriptions as

Full many a glorious morning have I seen
Flatter the mountain-tops with sovereign eye,
Kissing with golden face the meadows green,
Gilding pale streams with heavenly alchemy;

such word-pictures as

That time of year thou mayest in me behold,
When yellow leaves, or none, or few do hang
Upon those boughs which shake against the cold,
Bare ruined choirs, where late the sweet birds sang.

Sometimes the personal and the beautiful are gloriously intertwined, as in the sonnet bewailing the spring absence of one loved.

From you have I been absent in the Spring,
  When proud-pied April, dressed in all his trim,
Hath put a spirit of youth in every thing,
  That heavy Saturn laughed and leaped with him.

Yet nor the lays of birds, nor the sweet smell
  Of different flowers in odour and in hue,
Could make me any Summer's story tell,
  Or from their proud lap pluck them where they grew;

Nor did I wonder at the lily's white,
  Nor praise the deep vermilion in the rose;
They were but sweet, but figures of delight
  Drawn after you; you, pattern of all those.
    Yet seemed it Winter still, and, you away,
    As with your shadow I with these did play.

In these earlier and slighter poetical writings of Shakespeare, apart from the mighty dramas in which he pictured

All pains the immortal spirit must endure,
All weakness that impairs, all griefs that bow,

we see the qualities that led the next greatest poet of the English race, John Milton, so different from Shakespeare in his life-story, to say of him,

Thou in our wonder and astonishment
Hast built thyself a livelong monument.
For whilst, to the shame of slow-endeavoring art,
Thy easy numbers flow, and that each heart
Hath from the leaves of thy unvalued book
Those Delphic lines with deep impression took,
Then thou, our fancy of itself bereaving,
Dost make *us* marble with too much conceiving;
And so sepùlchred in such pomp dost lie,
That kings for such a tomb would wish to die.

THE NEXT STORY OF LITERATURE IS ON PAGE 833.

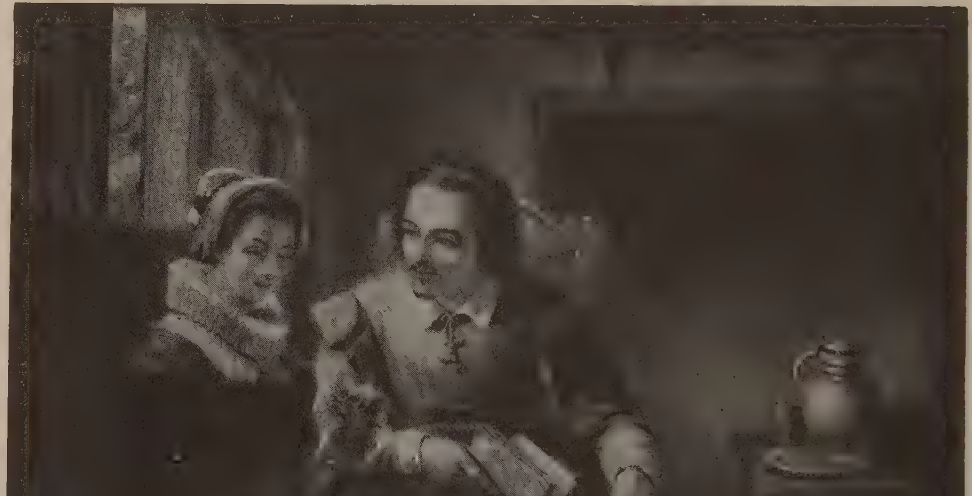
SHAKESPEARE IN TROUBLE AND IN TRIUMPH

This picture, by Thomas Brooks, illustrates a well-known story of Shakespeare's youth. The poet is said to have been arrested for illegally hunting deer in the forest at Stratford and brought before the magistrate, Sir Thomas Lucy. It is possible that the story is true, and in later years Shakespeare in one of his plays slyly made fun of Sir Thomas, which seems to show he had something against him.

In this picture by Eduard Ender, Shakespeare is seen at the height of his fame in London, reciting one of his great tragedies before Queen Elizabeth and a group of her courtiers. There were many of his plays that would have been absorbingly interesting to the queen, for they treated of her ancestors. As we study them we shall find court allusions, showing a consciousness of the royal interest.

SHAKESPEARE IN ANNE HATHAWAY'S COTTAGE

THE COTTAGE OF ANNE HATHAWAY, WHO BECAME SHAKESPEARE'S WIFE

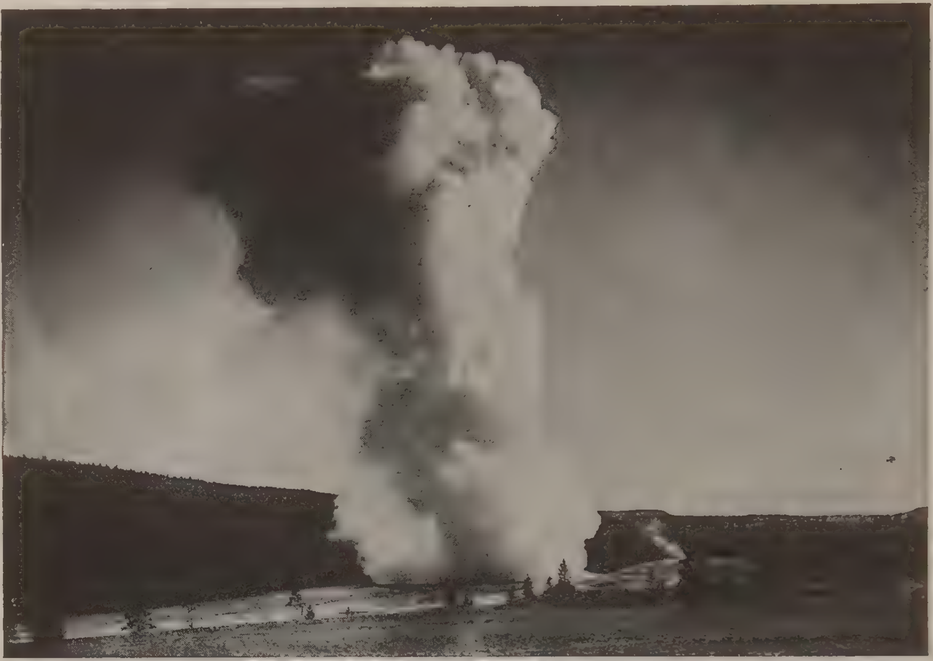


SHAKESPEARE AT NINETEEN, SITTING IN ANNE HATHAWAY'S COTTAGE AT STRATFORD

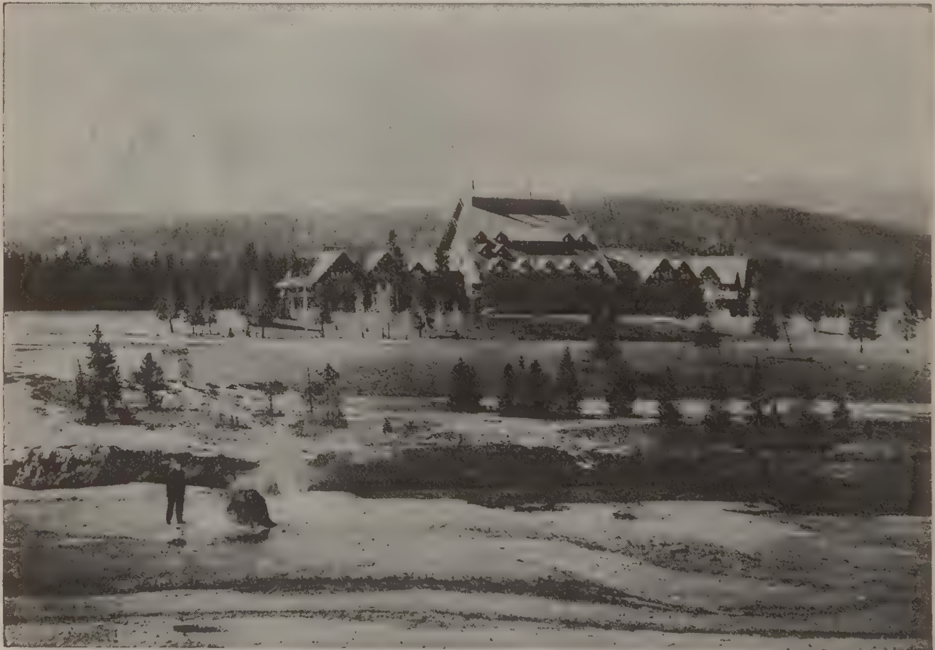
THE COUNTRY BOY OUTSIDE THE THEATRE

Shakespeare went to London to seek his fortune when he was about twenty-four years old. How he lived in London during his early years there, we do not know, but the story that he was glad to hang about the theatre to earn a little money by holding gentlemen's horses may very likely be true. Later he became an actor, and thus gained the valuable experience which proved of great assistance to him as a writer.

OLD FAITHFUL GEYSER AND INN



Some of the geysers in Yellowstone Park are very irregular in their eruptions and the visitor may easily miss seeing them in action. Old Faithful, however, can be depended upon, and for this reason it is a general favorite with visitors to the Park. The time between eruptions is from an hour to an hour and a half. The usual period is an hour and a quarter, and the eruption lasts four minutes.



There are several hotels in the Park, all under the supervision of the government, which fixes the rates they may charge the travelers. This is Old Faithful Inn, named from the geyser near by. The hotel is built entirely of logs and stone and is very attractive. Within a short distance are several other geysers. There are few places where a vacation can be spent more pleasantly than in Yellowstone Park.

Photos, courtesy of the Northern Pacific Railroad.

WHAT THIS STORY TELLS US

ONE of the most wonderful playgrounds in the United States, or in the world for that matter, is the Yellowstone National Park. It is under the control of the Department of the Interior, and contains interesting scenery of many kinds. The great geysers and the hot springs are like nothing else in this country. The cañon of the Yellowstone River is both beautiful and awe-inspiring. Besides these, there are over three thousand three hundred square miles where game of every sort ranges unafraid. No hunting is allowed; and elk, antelope, buffalo, bears and mountain sheep and many smaller animals are all to be seen. These animals know they will not be troubled.

YELLOWSTONE PARK, WONDERLAND OF THE WEST

THE Yellowstone National Park lies almost entirely in Wyoming, but a little of it is in Montana and Idaho. It was set aside for the use of the people in 1872, and since that time has been under the control of the United States government. There are 3,348 square miles of it, and perhaps nowhere else in the world are so many wonders of nature to be found in such a small area.

MAMMOTH HOT SPRINGS WITH THEIR WONDERFUL COLORS

We shall enter the Park from Gardiner, Montana, through the Northern Entrance Gate. We travel in a stage or a motor car through five miles of wild mountainous country until we come to the Mammoth Hot Springs. Here we dismount and follow the guide among the springs.

"The colors! Oh, the marvelous colors!" we exclaim in breathless astonishment, as our eyes wander from the transparent turquoise of the mist-hung pools to the fretted rims of red and orange, of green and velvety brown, over which the warm water slowly trickles, and from these to the dazzling whiteness of the crusted earth beyond, "as pure and clear as any snow field of the Alps." "The lovely tint of the terrace basins is due to a plantlike organism that lives in the hot water," our guide explains.

From Mammoth Hot Springs we proceed in the coach by slow and easy stages through a wild, strange place, called the "Hoodoos," or Goblin Land, which tradition says was formed by the Devil sliding down one mountain and his Satanic Majesty's wife down another. The result was this strange region called the Hoodoos. In reality this gruesome place was in all probability formed by a mountain which caved in, partly filling the cavern below. Of late years the government has constructed a road through Goblin Land, but owing to the deep caverns over which it is built this highway sometimes gives way.

Twelve miles beyond Mammoth Springs we drive over a roadway built out of solid glass about the base of Obsidian Cliff. On one side of us lies Beaver Lake, its quiet waters giving us back a picture of the pine-clad hills of its opposite shore, while on the other side of the roadway rises a glistening mirror-like mountain of jet-black polished glass. The roadway about the base of this glass mountain was built with great difficulty. As blasting powder could not be used, fires were built around the huge blocks of obsidian, and when the glass expanded with the heat, cold water was dashed upon their surface, shattering the blocks into small pieces.

We are on our way to see the

geysers. A geyser has been called a water volcano, and perhaps this is as good a description as we can get. Down deep in the earth the hot water collects and the steam becomes so compressed that something must give way. The water on top is forced out, sometimes with great force. The geyser is then quiet for a time, until the pressure again becomes too great, and then there is another eruption.

Driving on, we come at last to the Norris Geyser Basin, where the first sight that attracts our gaze is a vast spring of pale blue water called the Congress Pool. It is sometimes quiet, sometimes boiling, and has at different times thrown out mud. We branch off from Congress Pool a little way on foot to visit the Monarch, the king of geysers, in the Norris Basin. We find its mouth, out of which issue puffs of steam and little spurts of boiling water, situated at the foot of a hill of brilliantly colored rocks. But the geyser is not in action, and as it is very irregular, we mount the coach and hurry on to the Lower and the Upper Geyser Basins, hoping for better fortune there.

HELL'S HALF ACRE

Here we dismount and visit a place very aptly termed Hell's Half Acre. So gruesome, so awe-inspiring to the ordinary mortal, are the freaks of nature found in Yellowstone Park that they are almost unconsciously linked in one's mind with the Evil One and his abode. Truly this last region is most suggestive of the place and the name which it bears. Dense masses of steam overhang the land, and a sulphurous smell rushes up our nostrils, leaving us choking and gasping. The air is filled with hissing noises, and the very ground on which one treads is hot. We follow the guide, stepping gingerly over the volcanic crust, until we come to a ridge of small basins, which heave and sputter with pasty clay of every imaginable color—rich cream, vivid orange, brilliant blues, violets and purples—the Mammoth Paint Pots.

We turn with a feeling of relief from the Paint Pots to visit "Excelsior," once the largest geyser in the world. It has been quiet many years, and we see only a great opening filled to overflowing with boiling light blue waters, surrounded by crusted walls of pearl-like whiteness.

Another geyser of great interest to visitors in this vicinity is the Great Fountain, whose crater is about twenty feet around, and into whose clear blue water we can peer down at least fifteen feet, watching the bubbles coming up from the deeps and breaking on the surface. It plays two or three times a day.

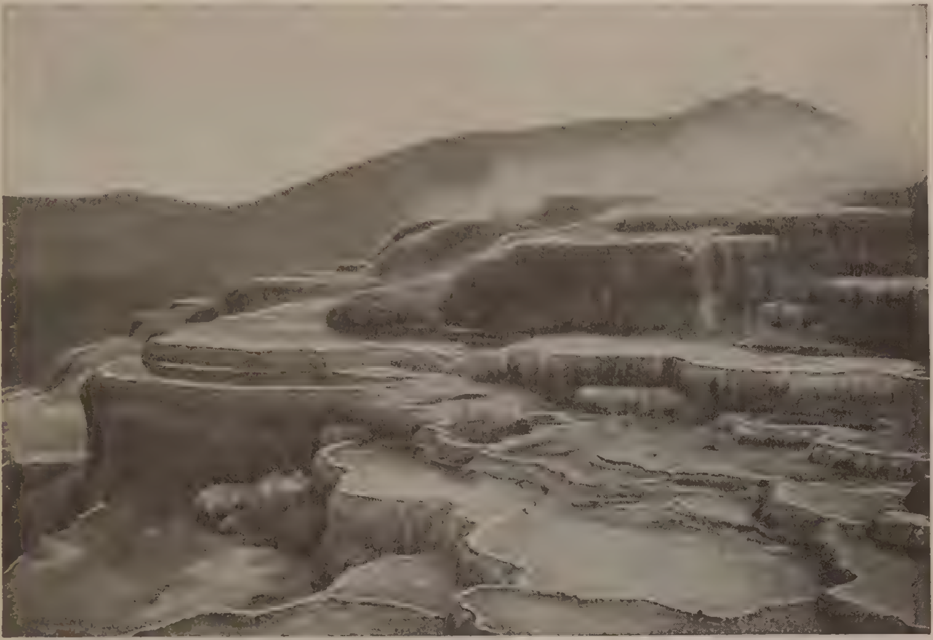
MORNING GLORY SPRING

But most wonderful of all the hot springs is the Morning Glory, which we see when at last we reach the Upper Geyser Basin. It is truly marvelous for the richness and variety of its coloring. "Imagine, if you can, a pool of water, about two feet in diameter, and formed after the shape of the morning glory you have seen in the fields. Imagine those selfsame colors, a little deeper in tone, transferred to this pool, or rather, perhaps, imagine Nature dipping her brush into the delicate tints of an autumn sunset and painting them upon the sides of this pool. Then imagine the whole filled with crystal liquid—we will not call it water, it is far too clear—that gives one the feeling of being solid air—and you have before you the Morning Glory of the Yellowstone."

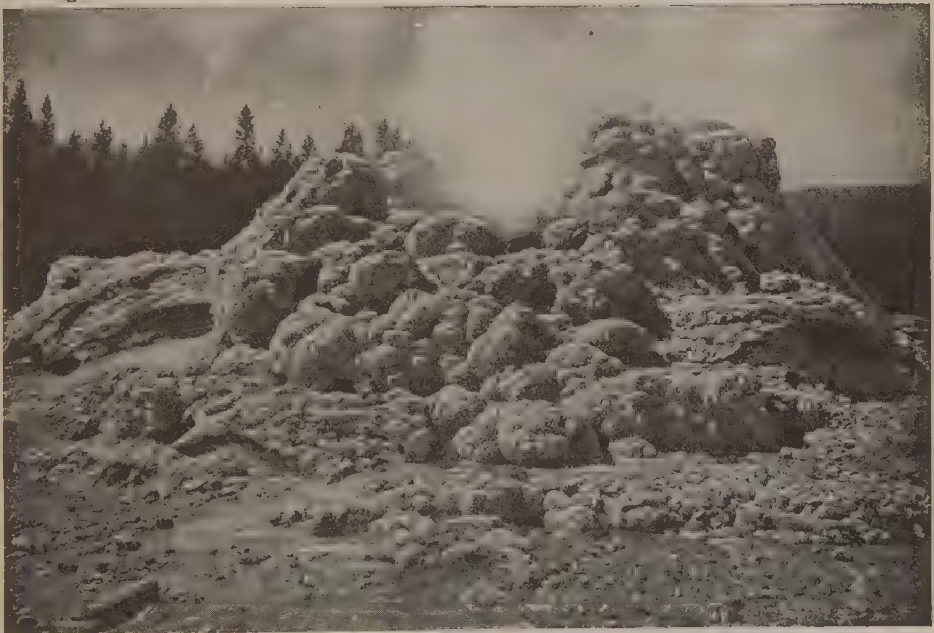
But the hot springs, with their sudden, blinding puffs of vapor and the thin, uncertain crusts about their rims deceptive to the unpracticed eye, are as dangerous as they are beautiful. There are many of these boiling pools of water, that sometimes shade off in colorless, clear ripples over the gray sinter. One writer tells of a pitiful little tragedy among the wee creatures of the Park. "Walking along the shore one day," he says, "a baby sandpiper, unmindful of danger, was seen to step into the treacherous pool, where it cheeped feebly to the distressed mother bird, and in an instant was floated off, dead, a tiny ball of fluffy feathers." Small animals are not the only things that are injured by these boiling pools. Cases have been known where people have tumbled into the scalding water and have been seriously injured and in some cases killed.

There are many geysers worth seeing in the Upper Geyser Basin, for it is the

SOME MARVELS OF THE YELLOWSTONE



Here is a picture of the Mammoth Hot Springs in Yellowstone Park. Notice how the pools, filled with water which almost boils, rise above one another in terraces. The water of the springs is a deep blue in the centre, and where it flows over the edge of the basins a thousand colors show, rainbow-hued, in the sunlight. Articles left in the water for a short time will be covered with a deposit of carbonate of lime. Over the terraces hangs a mist of steam, and beyond are the everlasting hills. The thin crusts at the edge of the basins are crumbling and treacherous, the sudden puffs of vapor blinding.



This is the crater of the Castle Geyser, one of the oldest active geysers in Yellowstone Park. The Castle has the largest cone in this whole region. It shoots up boiling water into the air to the height of fifty to seventy-five feet, accompanied by a great roar and mighty columns of steam. Eruptions of the geyser occur about every twenty-four hours for several days. Then it is quiet for a few days.

OTHER SIGHTS OF THE YELLOWSTONE

This beautiful road built into the side of the cliff is in the Golden Gate Cañon on the way from Mammoth Hot Springs to the Norris Geyser Basin. The roadbed on the side of the cliff is built of concrete.

This high pillar of stone is called Eagle Rock. By a fortunate chance an immense eagle was just alighting when the picture was being made. Note the many different layers of rock in the high pinnacle.

There are more bison, or American buffalo, in the Yellowstone Park than anywhere else in the United States. They live under natural conditions and are increasing in numbers. This small herd is near Mammoth Hot Springs, but the larger herd, several hundred in number, is more than thirty miles away.
Photos, courtesy of the Northern Pacific Railroad.

largest and most active geyser region in Yellowstone Park, if not in the world. We shall not have the time to visit them all, but we must see the Giantess, considered to be one of the most important geysers in the Park. Its eruptions occur irregularly, five to forty days apart, and we give a description of the Giantess in action in the words of one who saw the display. "News of the eruption spread rapidly," he writes. "Every one hastened to the brink of the great pool that was now boiling and acting as though a thousand furies were busily stirring its waters. At times the earth shook and trembled, and in the centre of the pool a mass of water shot upward a few feet and then fell back into the seemingly bottomless cavern. Every moment the water became more agitated, and loud groans, as of a giant in distress, broke the almost solemn stillness. At last the time came. Quicker than I can write, the entire pool was lifted bodily into the air. Higher it ascended and still higher and then shooting upward from the earth the great body rose, a solitary column, the top of which we could not see. The roar was deafening; the clouds of vapor rolled away towards the forests; streams of boiling water ran headlong to the river close at hand. The scene was one of awful beauty. It cannot be described. Its terrible fascination cannot even be imagined."

We try to imagine this scene as we stand by the Giantess, but we only see the gurgling hot water lapping against the sides of the mighty crater, and get puffs of its steam in our faces as the wind blows it in our direction. But though we cannot see the Giantess in eruption, there are many other geysers in the Upper Basin that are in constant activity. Old Faithful is worthy of its name. At intervals of about an hour, with little variation, it pours a mighty column of boiling water and steam; and then sucks it again into its bottomless pit to pour it forth once more. We stand afar off and watch the sunshine playing rainbow lights upon the cloud of steam.

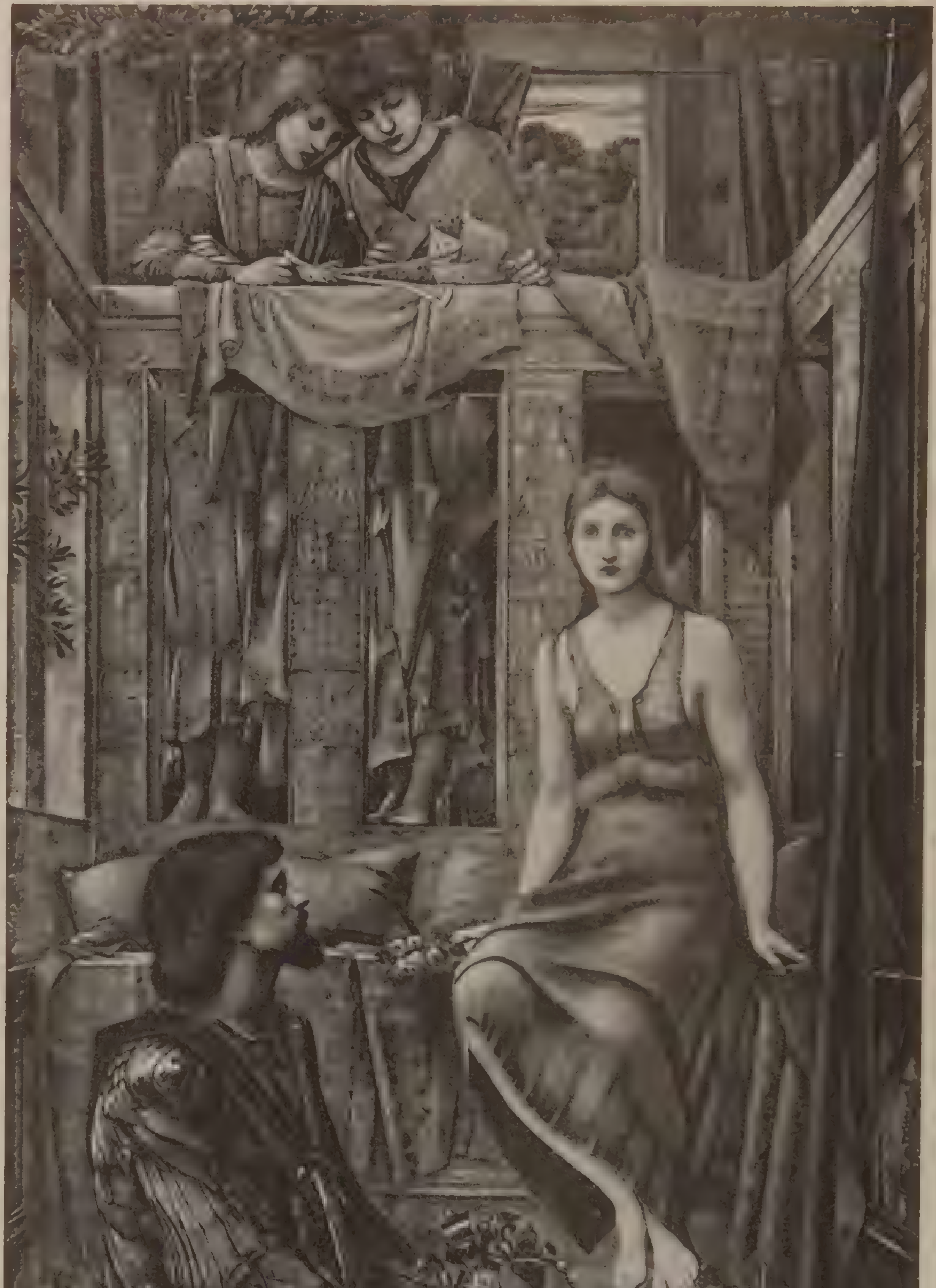
Leaving Old Faithful, we make a hurried trip to several other noted geysers—the Castle, the Giant, the Bee Hive, the Lion, the Lioness and the Cubs. If we are lucky we may see one of them in action, but we can seldom know exactly when to expect an eruption. Everywhere a heavy steam hangs warm and moist in the air. The constant roar and grumble of these geysers, combined with the gurgling and chafing of the boiling springs becomes frightful to us.

Leaving the geysers, we turn toward Yellowstone Lake, and come at last to the Upper Falls of the Yellowstone. Two-thirds as high as Niagara, they shoot over the rocks in mighty jets of water and spray, and striking the stones below, give back a thousand rainbow tints in the light of the setting sun. We do not say anything. We have no words to express the sense of the grandeur and beauty of the place that sinks into our very souls. A short distance beyond we come to the Lower Falls, whose waters, descending from a height twice that of Niagara, thunder over the precipice in a roaring, foaming flood of green and amber. We travel on up the Cañon, and take our stand at last on a rocky ledge to watch the night descend upon the Wonderland. Below us, between rock walls, the Yellowstone River flows for miles, until it becomes a narrowing ribbon of green disappearing into the distance.

There is much more to see in the Park. There are beautiful little lakes among the hills; the Tower Falls are almost as wonderful as those we have already seen; and we may turn aside to the petrified forests near by. For twenty miles along Lamar River are many stumps and trunks of trees which have been turned into stone. Specimen Ridge, which rises sharply out of the valley floor, is composed of beds of these forests one above the other.

Nor is this all. Yellowstone Park is the largest refuge for wild animals in the world. No hunting is allowed, and thousands of elk, antelope, and moose, hundreds of buffalo, and many bears, brown, cinnamon and black, wander unafraid of man. They know that they will not be harmed. Even the dreaded grizzly, which is not often seen, does not attack men, unless provoked. Fishing is allowed, and the Park is a paradise for the angler. One may remain weeks in the Wonderland and then fail to see all the interesting and attractive things.

KING COPHETUA AND THE BEGGAR MAID



Cophetua sware a royal oath: "This beggar maid shall be my queen."—This painting is by Sir Edward Burne-Jones.

THE PLEASURES OF MEMORY

THE memory ought to be a storehouse, not a lumber-room, says an old writer; and there is nothing we can store away in this magic chamber of our mind more worth having than the riches of the poets, which will outlast other possessions. "The pleasures of memory" have been sung by more than one of our poets, and though, of course, poetry is by no means the only one of these pleasures, it is one of the greatest. Here we are to see how it may best be stored in our memory.

HOW TO REMEMBER POETRY

CONTINUED FROM 611

A LITTLE girl was once asked what her memory was, and she said, "It is the thing I forget with." To how many of us, both old and young, is the memory the thing we forget with! Yet it is quite an easy matter to make it the thing we remember with. All our faculties can be made better by use. If we do not practice walking regularly, we shall in time develop into very poor walkers. That is so apparent that any boy or girl does not need to be told it. If we do not practice remembering, we shall in time find our memory is of little use to us.

It is with our brain that we remember; our "memory" is one of the departments of the work of the brain. One might think that memory could do only a certain amount of work; that it could remember just a certain number of things; that a time would come when, so to say, the storehouse of memory was full. But that is not so. There is no limit to what our brain, if properly set to work, will enable us to remember. In olden times, before printing was invented, whole books, such as Homer's Iliad, described on page 1983, were carried for years in the memory of people. Most of our legends existed for ages in the memories of common people only, and were not written down in some cases until hundreds of years had passed away. Now, of all written words, none are easier to carry in our minds than poetry, and we should make a habit of "learning by heart" as many poems as possible; not merely for the sake of remembering them, but to exercise our minds, just as we walk to exercise our legs. There are many "systems" of remembering, but if we begin while young to remember what we have read, we shall not need systems; our minds, when young and fresh, form systems for themselves without any effort on our part. But there are a few simple rules that may help us.

We must read with close *attention* to what the writer has to say, be it in prose or poetry. Secondly, we should read once in order to get a general idea of the author's story. For instance, to remember Lord Ullin's Daughter, we read it first in order to get the story, noting how one thing follows on another: the flight of the lovers, the pursuit by the angry father, the storm on the lake, the boat overwhelmed by the waves, and the father's lament for his daughter.

We next read more closely still, noting the chief points of each verse, thus: (1) boatman and ferry; (2) Highland chief and Lord Ullin's daughter; (4) horsemen, bonny bride, and so forth. Finally, we have the actual words to remember, and this we do, first, by noting the rhythm (see page 605) and the rhyme (see page 99); secondly, by emphasizing in our minds the "picture-words," as we call the particular words in each verse that raise up a picture before our minds. In the second verse of this poem the picture-words are "stormy water"; in the third "glen" and "heather." These words suggest "pictures" to us at once, and help us to recall the verse more easily. Of course, we must read the poem many times before we have it "by heart," and it should be read aloud as often as possible.

THE BEGGAR MAID

The legend of King Cophetua and the beggar maid is very old, and is mentioned by Shakespeare in several of his plays. Tennyson tells it perfectly in the space of sixteen lines.

HER arms across her breast she laid;
She was more fair than words can say:
Bare-footed came the beggar maid
Before the king Cophetua.
In robe and crown the king stept down,
To meet and greet her on her way;
"It is no wonder," said the lords,
"She is more beautiful than day."

As shines the moon in clouded skies,
She in her poor attire was seen;
One praised her ankles, one her eyes,
One her dark hair and lovesome mien.
So sweet a face, such angel grace,
In all that land had never been.
Cophetua sware a royal oath:
"This beggar maid shall be my queen!"

LULLABY OF AN INFANT CHIEF

This tiny poem by the great Sir Walter Scott takes us back to the days of old warfare, the days of old romance, about which Sir Walter loved to write in his fine books.

OH, hush thee, my baby! thy sire was a knight,
Thy mother a lady, both lovely and bright;
The woods and the glens, from the towers which we see,
They all are belonging, dear baby, to thee.

Oh, fear not the bugle, though loudly it blows!
It calls but the warders that guard thy repose;
Their bows would be bended, their blades would be red,
Ere the step of a foeman draws near to thy bed.

Oh, hush thee, my baby! the time will soon come
When thy sleep shall be broken by trumpet and drum;
Then hush thee, my darling! take rest while you may,
For strife comes with manhood, and waking with day.

MY MOTHER

This children's poem has long been a favorite, expressing what each of us must feel about our mother's love. It was written by Jane Taylor, who wrote The Star, on p. 1138.

WHO fed me from her gentle breast,
And hush'd me in her arms to rest,
And on my cheeks sweet kisses prest?
My Mother.

When sleep forsook my open eye,
Who was it sang sweet hushaby
And rock'd me that I should not cry?
My Mother.

Who sat and watch'd my infant head
When sleeping on my cradle bed,
And tears of sweet affection shed?
My Mother.

When pain and sickness made me cry,
Who gazed upon my heavy eye,
And wept, for fear that I should die?
My Mother.

Who drest my doll in clothes so gay,
And taught me *pretty* how to play,
And minded all I had to say?
My Mother.

Who ran to help me when I fell,
And would some pretty story tell,
Or kiss the place to make it well?
My Mother.

Who taught my infant lips to pray,
And love God's holy book and day,
And walk in wisdom's pleasant way?
My Mother.

And can I ever cease to be
Affectionate and kind to thee,
Who wast so very kind to me,
My Mother.

Ah! no, the thought I cannot bear,
And if God please my life to spare,
I hope I shall reward thy care,
My Mother.

When thou art feeble, old and gray,
My healthy arm shall be thy stay,
And I will soothe thy pains away,
My Mother.

And when I see thee hang thy head,
'Twill be my turn to watch thy bed,
And tears of sweet affection shed,
My Mother.

WEE WILLIE WINKIE

This famous Scotch nursery song was written by a Glasgow workingman named William Miller, who died in 1872. Willie Winkie is known to some children as "The Sandman," who comes to make the children sleepy.

WEE Willie Winkie rins through the town,
Upstairs and downstairs in his nicht-gown;
Tirling at the window, crying at the lock,
"Are the weans in their bed, for it's now ten o'clock?"

Hey, Willie Winkie, are ye coming ben?
The cat's singing grey thrums, to the sleeping hen;
The dog's spelder'd on the floor, and doesna' gie a cheep,
But here's a waukrife laddie that winna' fa' asleep.

Onything but sleep, you rogue! Glow'ring like the moon,
Rattling in an airn jug wi' an airn spoon;
Rumblin', tumblin', round about, crawing like a cock,
Skirlin' like a kenna-what, wauk'nin' sleeping folk.

Hey, Willie Winkie, the wean's in a creel!
Wamblin's aff a body's knee like a very eel,
Ruggin' at the cat's lug, rav'llin' a' her thrums—
Hey, Willie Winkie—see, there he comes!

Wearied is the mither that has a stoorie wean,
A wee stumpie stousie, that canna rin his lane,
That has a battle aye wi' sleep, before he'll close an e'e—
But a kiss frae aff his rosy lips gies strength anew to me.

"OH, I'M THE CHIEF OF ULVA'S ISLE, AND THIS, LORD ULLIN'S DAUGHTER!"

LORD ULLIN'S DAUGHTER

This is one of the best known of Thomas Campbell's poems, in which an old Highland story is told in the simple, straightforward style of the ballad. A ballad is usually a romantic story in verse, but it may be humorous. This one is tragic in the highest sense, and gives a stirring picture of a Scottish loch, or lake, during a great storm. In olden days people thought evil spirits lived in the lakes, and the scream of the storm was the evil spirit, or "water-wraith," mentioned in the seventh verse, delighting in its work.

A CHIEFTAIN to the Highlands bound
Cries: "Boatman, do not tarry!
And I'll give thee a silver pound
To row us o'er the ferry!"

"Now who be ye, would cross Lochgyle,
This dark and stormy water?"
"Oh, I'm the chief of Ulva's isle,
And this, Lord Ullin's daughter!

"And fast before her father's men
Three days we've fled together,
For should he find us in the glen
My blood would stain the heather.

"His horsemen hard behind us ride—
Should they our steps discover,
Then who will cheer my bonny bride
When they have slain her lover?"

Out spoke the hardy Highland wight,
"I'll go, my chief, I'm ready!
It is not for your silver bright,
But for your winsome lady:

"And, by my word, the bonny bird
In danger shall not tarry;
So though the waves are raging white,
I'll row you o'er the ferry."

By this the storm grew loud apace,
The water-wraith was shrieking;
And in the scowl of heaven each face
Grew dark as they were speaking.

But still as wilder blew the wind,
And as the night grew drearer,
Adown the glen rode armèd men,
Their trampling sounded nearer.

"Oh, haste thee, haste!" the lady cries,
"Though tempests round us gather;
I'll meet the raging of the skies,
But not an angry father."

The boat has left a stormy land,
A stormy sea before her—
When, oh, too strong for human hand
The tempest gathered o'er her!

And still they rowed amidst the roar
Of waters fast prevailing;
Lord Ullin reached that fatal shore—
His wrath was changed to wailing:

For sore dismayed, through storm and shade,
His child he did discover;
One lovely hand she stretched for aid,
And one was round her lover.

"Come back! come back!" he cried in grief,
"Across this stormy water;
And I'll forgive your Highland chief—
My daughter—O my daughter!"

'Twas vain: the loud waves lashed the shore,
Return or aid preventing:
The waters wild went o'er his child,
And he was left lamenting.

BANNOCKBURN

Every country has its national songs, in which the heroic spirit of its people is expressed and its great deeds remembered. Scotland is rich in these songs, and perhaps the most famous celebrates the heroism of the Scots at the battle of Bannockburn, where they defeated the English. It was written by Robert Burns, a great Scottish poet.

SCOTS, wha hae wi' Wallace bled—
Scots, wham Bruce has aften led—
Welcome to your gory bed,
Or to victorie!

Now's the day, and now's the hour:
See the front o' battle lower;
See approach proud Edward's power—
Chains and slaverie!

Wha will be a traitor knave?
Wha can fill a coward's grave?
Wha sae base as be a slave?
Let him turn and flee!

Wha for Scotland's king and law
Freedom's sword will strongly draw,
Freeman stand or freeman fa'—
Let him on wi' me!

By oppression's woes and pains!
By your sons in servile chains!
We will drain our dearest veins,
But they shall be free!

Lay the proud usurpers low!
Tyrants fall in every foe!
Liberty's in every blow!
Let us do, or die!

PICTURES IN THE FIRE

On page 101 we read R. L. Stevenson's fanciful verses about Armies in the Fire. Here is Adelaide Anne Proctor's poem with the same fancy, but which gives us an ever-changing series of the pictures we may see in the fire. It is more sentimental than Stevenson's, and not quite so simple.

WHAT is it you ask me, darling?
All my stories, child, you know;
I have no strange dreams to tell you,
Pictures I have none to show.

Tell you glorious scenes of travel?
Nay, my child, that cannot be;
I have seen no foreign countries,
Marvels none on land or sea.

Yet strange sights in truth I witness,
And I gaze until I tire;
Wondrous pictures, changing ever,
As I look into the fire.

There, last night, I saw a cavern,
Black as pitch; within it lay
Coiled in many folds a dragon,
Glaring as if turned at bay.

And a knight in dismal armour
On a wingèd eagle came,
To do battle with this dragon;
And his crest was all of flame.

As I gazed the dragon faded,
And, instead, sat Pluto crowned,
By a lake of burning fire;
Spirits dark were crouching round.

That was gone, and lo! before me,
A cathedral vast and grim;
I could almost hear the organ
Peal along the arches dim.

As I watched the wreathèd pillars,
Groves of stately palms arose,
And a group of swarthy Indians
Stealing on some sleepy foes.

Stay; a cataract glancing brightly,
Dashed and sparkled; and beside
Lay a broken marble monster,
Mouth and eyes were staring wide.

Then I saw a maiden wreathing
Starry flowers in garden sweet;
Did she see the fiery serpent
That was wrapped about her feet?

That fell crashing all and vanished;
And I saw two armies close—
I could almost hear the clarions,
And the shouting of the foes.

They were gone, and lo! bright angels,
On a barren mountain wild,
Raised appealing arms to Heaven,
Bearing up a little child.

And I gazed, and gazed, and slowly
Gathered in my eyes sad tears,
And the fiery pictures bore me
Back through distant dreams of years.

Once again I tasted sorrow,
With past joy was once more gay,
Till the shade had gathered round me—
And the fire had died away.

WHAT EVERYONE KNOWS

COCKS crow in the morn
To tell us to rise,
And he who lies late
Will never be wise;
For early to bed,
And early to rise,
Is the way to be healthy,
And wealthy, and wise.

THE WORLD

William Brighty Rands, the author of this poem, wrote much charming verse of a light, humorous kind. In The World there is a touch of humor, but it has the common-sense which asks us to remember that, though we may be insignificant in size compared with nature, we have the power to triumph over nature. We have brain—but we must use it.

GREAT, wide, beautiful, wonderful world,
With the wonderful water round you curled,
And the wonderful grass upon your breast—
World, you are beautifully drest.

The wonderful air is over me,
And the wonderful wind is shaking the tree,
It walks on the water and whirls the mills,
And talks to itself on the tops of the hills.

You friendly Earth! how far you go,
With the wheat-fields that nod and the rivers that flow,
With cities and gardens, and cliffs and isles,
And people upon you for thousands of miles!

Ah! you are so great, and I am so small,
I tremble to think of you, World, at all;
And yet when I said my prayers to-day,
A whisper inside me seemed to say:
"You are more than the Earth, though you are such a dot;
You can love and think, and the Earth cannot."

LITTLE VERSES FOR VERY LITTLE PEOPLE

HI! diddle diddle,
The cat and the fiddle,
The cow jumped over the moon:
The little dog laughed
To see such sport,
While the dish ran after the spoon.

SING, sing, what shall I sing?
The cat has eaten the pudding-string!
Do, do, what shall I do?
The cat has bitten it quite in two.

WHO comes here?
A grenadier.
What do you want?
A pot of beer.
Where is your money?
I have none.
Then, grenadier,
Get you gone.

THIRTY days hath September,
April, June, and November;
February has twenty-eight alone.
All the rest have thirty-one;
Excepting leap-year, that's the time
When February's days are twenty-nine.

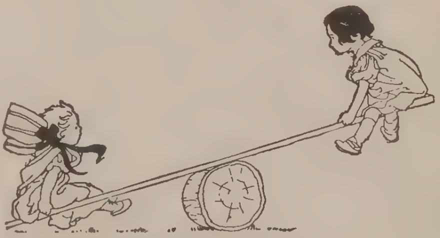
LITTLE Tom Tucker
Sings for his supper;
What shall he eat?
White bread and butter.
How shall he cut it
Without a knife?
How can he marry
Without a wife?

YOUNG lambs to sell!
Young lambs to sell!
If I'd as much money as I could tell,
I never would cry—Young lambs to sell!

LITTLE Nanny Etticoat,
In a white petticoat,
And a red nose;
The longer she stands
The shorter she grows.

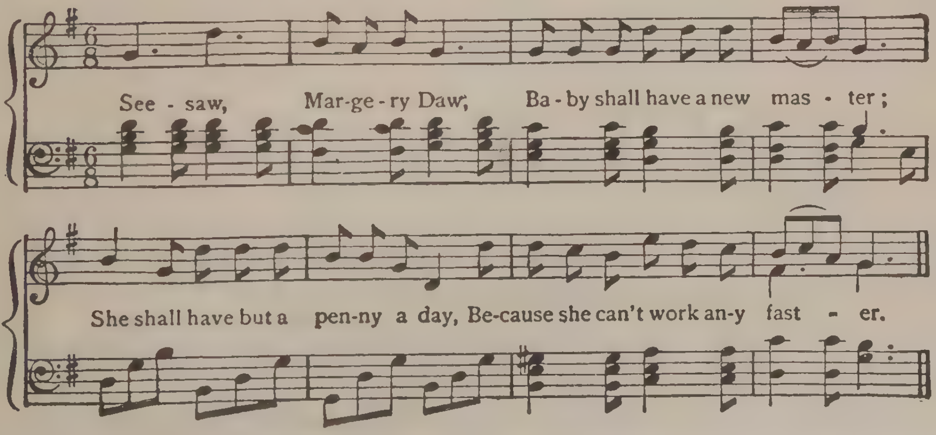
PETER PIPER picked a peck of pickled pepper;
A peck of pickled pepper Peter Piper picked;
If Peter Piper picked a peck of pickled pepper,
Where's the peck of pickled pepper Peter Piper picked?

BYE, Baby Bunting,
Daddy's gone a-hunting
To get a little rabbit-skin
To wrap a Baby Bunting in.



SEE-SAW, Margery Daw,
Baby shall have a new master;
She shall have but a penny a day,
Because she can't work any faster.

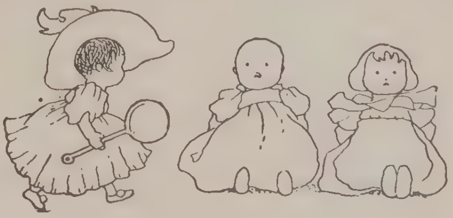
SEE-SAW, MARGERY DAW


See - saw, Mar-ge - ry Daw, Ba - by shall have a new mas - ter;
She shall have but a pen-ny a day, Be-cause she can't work an-y fast - er.

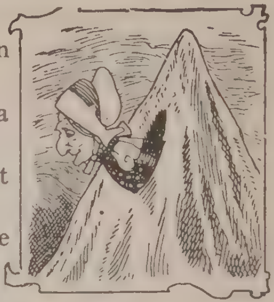
TO market, to market, to buy a fat pig,
Home again, home again, Jiggety Jig.
To market, to market, to buy a fat hog,
Home again, home again, Jiggety Jog.

THERE were two blackbirds,
Sitting on a hill,
The one named Jack,
The other named Jill;
Fly away, Jack! Fly away, Jill!
Come again, Jack! Come again, Jill!

ROBIN and Richard were two pretty men;
They lay in bed till the clock struck ten;
Then up starts Robin and looks at the sky,
Oh, brother Richard, the sun's very high!
You go on with bottle and bag,
And I'll follow after on jolly Jack Nag.



COME, let's to bed,
Says Sleepy-head,
Tarry a while, says Slow,
Put on the pan, says Greedy Nan,
Let's sup before we go.



THERE was an old woman
Lived under a hill;
And if she's not gone,
She lives there still.

LITTLE Jack Horner sat in a corner
Eating a Christmas pie;
He put in his thumb, and he took out a plum,
And said, "What a good boy am I!"

THIS little pig went to market,
This little pig stayed at home,
This little pig got roast beef,
This little pig got none;
This little pig cried "Wee, wee!"
all the way home.

FOUR and twenty tailors went to kill a snail,
The best man amongst them durst not touch her tail;
She put out her horns like a little Kyloe cow,
Run, tailors, run, or she'll kill you all e'en now.

HERE am I, little Jumping Joan,
When nobody's with me
I'm always alone.

MATTHEW, Mark, Luke and John,
Guard the bed that I lie on!
Four corners to my bed,
Four angels round my head—
One to watch, one to pray,
And two to bear my soul away.

LITTLE VERSES FOR VERY LITTLE PEOPLE

"WHERE are you going to, my pretty maid?"
"I am going a-milking, sir," she said.

"May I go with you, my pretty maid?"
"You're kindly welcome, sir," she said.
"What is your father, my pretty maid?"
"My father's a farmer, sir," she said.
"Say, will you marry me, my pretty maid?"
"Yes, if you please, kind sir," she said.
"Will you be constant, my pretty maid?"
"That I can't promise you, sir," she said.
"Then I won't marry you, my pretty maid!"
"Nobody asked you, sir," she said.

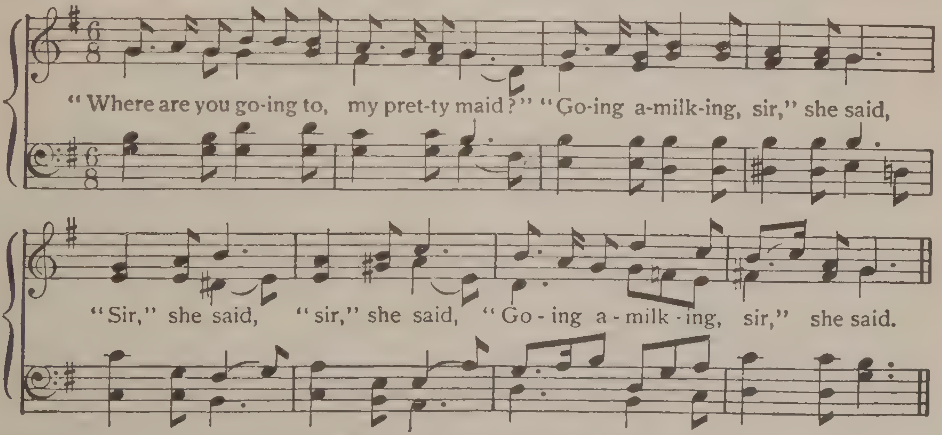
IF I had as much money as I could spend,
I never would cry old chairs to mend;
Old chairs to mend, old chairs to mend;
I never would cry old chairs to mend.
If I had as much money as I could tell,
I never would cry old clothes to sell;
Old clothes to sell, old clothes to sell;
I never would cry old clothes to sell.

TWO sticks and an apple,
Say the Bells of Whitechapel;
Old Father Bald Pate,
Say the Bells of Aldgate;
Maids in white aprons,
Say the Bells at St. Catherine's;
You owe me ten shillings,
Say the Bells at St. Helen's;
When will you pay me?
Say the Bells of Old Bailey;
When I am rich,
Say the Bells of Shoreditch;
When will that be?
Say the Bells of Stepney;
I do not know,
Says the great Bell at Bow.

WHEN little Sammy Soapsuds
Went out to take a ride,
In looking over London Bridge
He fell into the tide.

His parents never having taught
Their loving Sam to swim,
The tide soon got the mastery,
And made an end of him.

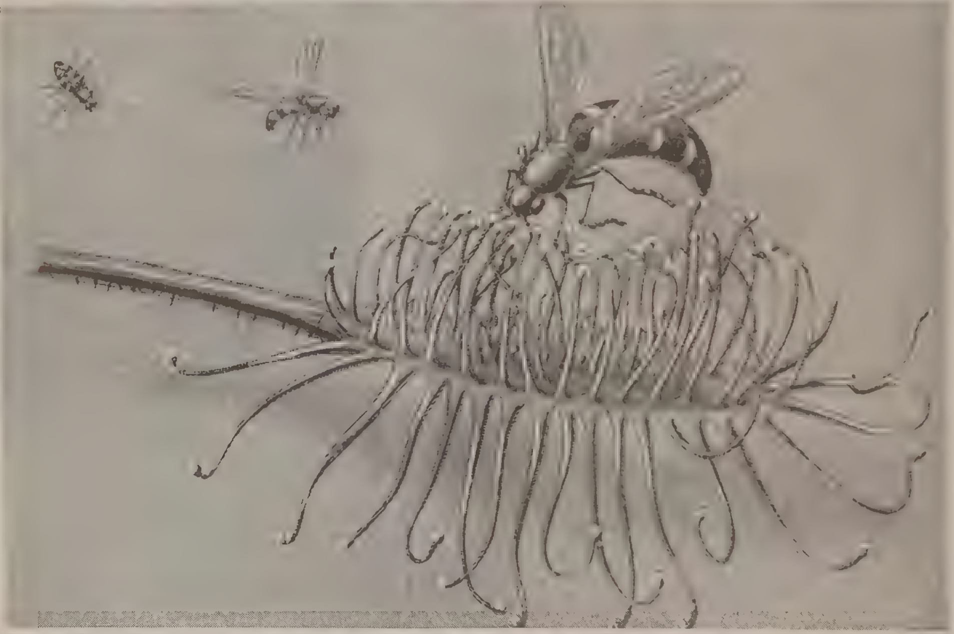
"WHERE ARE YOU GOING TO, MY PRETTY MAID?"


"Where are you go-ing to, my pret-ty maid?" "Go-ing a-milk-ing, sir," she said,
"Sir," she said, "sir," she said, "Go - ing a - milk - ing, sir," she said.

A SWAMP PLANT THAT EATS AN INSECT

The round-leaved sundew, common in swamps, bogs and moist ground, is one of the most interesting plants, for it catches insects and eats them.

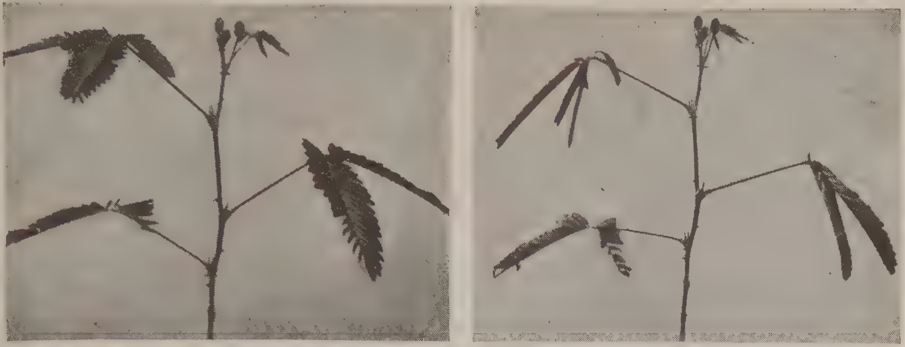
Its leaves, rather smaller than a dime, are covered with about 200 hair-like tentacles, covered with a sticky substance that glistens in the sun.



The tentacles remain spread out till an unwary fly in search of nectar happens to touch one or more with its antennæ. At once it is held, and the more it struggles to free itself, the more it becomes involved.

When the insect is completely enveloped it is suffocated in about a quarter of an hour.

At last, when the insect has been digested, the tentacles open and the remains are dropped out.



The sensitive plant, the leaves of which close up at the slightest touch, as shown in the right-hand picture.

HOW PLANTS MOVE AND FEEL

CONTINUED FROM 616

SOME of the simplest plants, which are single cells, so small as to be seen only under the microscope, swim about by means of living lashes, just as many of the simplest animals do. On the other hand, there are many animals, such as sponges and corals, which do not move except in their earliest days.

Yet, when we have allowed for the fact that some single-cell plants do move and the fact that some animals do stand still, the big fact stands out that plants are usually fixed, while animals are usually free. Plants expend little energy in locomotion; animals spend much.

It is important to avoid extreme or fanciful statements in this connection. While plants retain a power of movement in many of their parts, they have nothing corresponding to the muscles of animals; and while plants often show an exquisite sensitiveness to changes in light and warmth, to gravity and moisture, and even to touch, they have nothing at all like a nervous system.

It is altogether a mistake to use words like "sagacity" or "intelligence" in speaking of plants; what we are sure of is that they show a sort of feeling, even an *irritability*, and a shrinking away, as it were. They answer-back to outside influences, and a tree may respond even to the shadow of a passing cloud. They also move part of their body in an effective way. If we go on to say that plants must have something corresponding to man's mind, no one can prove that we are wrong; but we have passed beyond a point at which science can prove what we say.

The stem of the giant bamboo may grow a foot in a day, and a naturalist reports that he saw with the naked eye the growing of a bamboo in Java. Growth means increase in size; the amount of the living matter is added to, and there is a *redistribution of material.* The growing units, or cells, are very *tense,* for there is a pressure on the cell-wall exerted from within by the watery living matter and the cell-sap. The living matter just inside the cell-wall controls the give-and-take between the cell-sap and the cell-wall, and thus controls the tenseness.

Everyone knows the limpness of a shoot that has been cut off from its water supply; it is worse than a punctured tire. It is losing water into the air and gaining none back; its cells lose their tenseness and the shoot withers. If we put the cut end into water before the withering has gone too far, the shoot will become stiff once more.

Professor Bower compares the relation of the tense cell-substance and the resisting cell-wall to the relation between the bladder of a football and the leather skin. When the bladder is blown up, the outer skin is firm and rigid; when the air is withdrawn from the bladder, the outer skin is soft and limp. But in the case of the football the pressure is gaseous, while in the case of the plant-cell the pressure is fluid. It is worth while to dwell a little on the tenseness of growing and active plant-cells. The movements of growing parts, and of full-grown parts, depend on changes in tenseness.

Charles Darwin detected the bending and bowing of seedlings. On the apex of a growing shoot he fixed a fine glass bristle with a bead at the tip, and from time to time he registered the position of the bead on a horizontal glass plate above the plant. He found that the tip of the shoot does not grow straight up; it bends and bows to the different points of the compass.

The movement is very slow, but it goes on whenever growth is going on; and it is due to the fact that the growth does not take place equally all round. What comes to the same thing is, that there are changes in the tenseness of the growing cells in different parts of the shoot; and these seem to depend on the plant itself, not on outside changes. They are movements from within.

THE TWINING AND COILING MOVEMENTS OF THE SENSITIVE TENDRIL

The movements of tendrils are of great use, for they attach the plant firmly but elastically to its support and help to pull it up. The tip of the slender green lasso of the bryony in the hedgerow moves slowly round in a circle, and this increases its chance of touching some support. If the under-surface be rubbed a little, the tendril grows faster on the opposite side. Dr. MacGregor Skene describes what follows:

> As the tip curves, new points come into contact with the support, and the stimulus is thus constantly renewed, so that the tendril goes on twining round the support until the whole of the free tip has been used up.
>
> The coiled part hardens and becomes woody, clasping the support firmly. The long, straight portion, between the support and the base of the tendril, twists into a tight corkscrew, reversed once or twice—for a thread fixed at both ends cannot be forced into a spiral, without at least one reversal in the direction of the hoist—and then becomes woody.
>
> The corkscrew is of great mechanical importance. Did the free part of the tendril remain straight, any gust of wind, or shock from a passing animal, would throw a great, perhaps a breaking, strain on it. The tight spiral acts as a spring. If pulled, it opens out a little, to contract again when the pull ceases, bringing the plant back to its original position, and avoiding a rupture.

Here we have many striking things: a searching movement of the tip, an exquisite sensitiveness to contact, a twining round the support, and a spiral coiling of the free part of the tendril.

HOW THE TIP OF THE GROWING ROOT IS SENSITIVE TO GRAVITY

When a seed sprouts, however it has been lying, the young shoot grows upward and the young root grows downward. It is their nature so to do. If the seedling starts rightly and is then turned upside down, it will soon have its root growing down once more and its stem growing up. Of course, it may come about that the root's tendency to seek moisture may be strong enough to counteract the tendency to grow toward the centre of the earth.

Very careful experiments have shown that the root's sensitiveness to gravity is situated at its very tip, and that this affects the area of most rapid growth a little higher up. It is the living matter of these quickly growing cells that answers-back by altering the direction of growth. In the tip-cells of the root there are starch grains which normally settle on the lower side of the cell. If the root-tip is forcibly pointed upward, the starch grains will change their position, and some botanists think that this is the reason for the change. If so, the starch grains might be compared in this respect to the tiny particles of sand or lime found in the ear cavities of many little creatures. When the animal is suddenly moved, these particles in the ear have also to move; their movements affect nerve-endings in the ear; and the animal *answers-back*. In any case, what is certain is that the tip of the root is sensitive to gravity and that the root adjusts the direction of its growth if it is interfered with.

THE THIRSTY ROOTLETS OF TREES THAT INVADE A DRAIN-PIPE

From a beautiful spring a terra-cotta drain-pipe led away the water for use elsewhere; but every year or two there was a blocking of the pipe and a flooding at the well. There was nothing to do but to dig up the pipe, and then it was seen that string-like rootlets of adjacent trees had got in at the joints. Inside the pipe the invaders branched out into a remarkable mass almost like tangled hair, and the result was a block in the pipe.

Now the interesting point was that the roots grew from a considerable distance to the water-pipe. They followed the increasing dampness in the soil, and found their way into the water almost as if they were boring animals. There is no real reason for supposing that the roots had any knowledge of the water at a distance, or that they "made up their minds" to reach it; all we are sure of is that roots are sensitive to moisture and grow toward it, altering the direction of their growth according to the conditions in the soil around them.

Plants grown in a window turn toward the light, and they would become lopsided if the flower-pot were not turned round. It seems a very sensible thing to do, to spread themselves so that they get the most of the light which comes in. But what the plant does is done automatically; it is due to inequalities of growth. The stem grows less rapidly on the more illumined side, for light has a delaying influence on growth. This is just the opposite of the influence of heat, which hastens growth, as we see in hothouses. Now, if the growing part of a shoot in a window grows less rapidly on the side next to the light, the result must be a bending toward the window.

LITTLE LENSES LIKE EYES IN THE SURFACE-CELLS OF SHOOTS

It is interesting to watch a growing shoot of ivy—to notice that it bends away from the light. Moreover, before it attaches itself, it gives off brownish aerial rootlets, and these are all toward the shaded side. This is plainly all the better for gripping a wall or a tree. The same is well seen in the fixing disks of the Virginia creeper. So it is not necessary that a shoot structure must grow toward the light; it is, indeed, occasionally the other way. It has been suggested that the surface-cells of the growing shoot sometimes act like little lenses, concentrating the light on the more living growing cells within. If so, they would be rather like the very simple eyes of some backboneless animals.

So plants answer-back to gravity, to moisture and to light: and their answers are seen in movements of their growing parts. There are other influences to which plants are sensitive, such as electricity, chemicals and even air. If plants have not what we call senses, they have at all events a very great sensitiveness to outside influences.

Another point of importance is that a change in the growth of a part of a plant may become fixed when the part becomes older and therefore stiff. Some peculiarity stamped on the growing portion may last throughout life. It remains as a record of something the plant has experienced; it is a dint from without, not an outcrop from within; and it does not seem likely that it can be handed on as such to the next generation. But if the same peculiar influences play on the children plants, then they will show the same answers-back as their parents.

THE MOVEMENT AND FOLDINGS OF THE SENSITIVE PLANT

So far we have dealt with sensitiveness and movements in growing plants, or, we may say, in parts which are still young. Let us pass to sensitiveness and movements in full-grown parts.

Thus the beautiful three-bladed leaves of the clover and the wood-sorrel are spread out during the day, but folded downward at nightfall. This may protect them from overcooling at night; but it is not very clear. Similarly, many flowers, like daisies, close up at dusk; and others, like the yellow sorrel, when the day is dull. Most attention has been given to the sensitive plant. The beautiful feathery leaves expand horizontally during the day, but fold up like a closed umbrella in the evening. The opposite leaflets of each division of the compound leaf fold their upper surfaces together; the divisions of the compound leaf seem to huddle together instead of being like an expanded fan; and the leaf-stalk sinks from a more or less erect position and hangs downward at a sharp angle. The same remarkable movements may be brought about in a minute by shaking the plant. We know that they are due to changes in the tenseness of cells at the hinge of the leaf-stalk or at the base of each division of the leaf.

MESSAGES THAT TRAVEL BY DELICATE TUBES FILLED WITH SAP

If we pinch a leaflet at the tip of one of the divisions of the leaf we can follow the message. One pair of leaflets after another may be seen folding together, and finally the leaf as a whole droops down. There is evidently the handing-on of an influence from one part of the leaf to another part at a considerable distance, and it may be from one leaf to another. It is probable that the message travels by long, delicate tubes filled with sap surrounded by a delicate sheaf of living matter.

WHAT HAPPENS WHEN THE BEE VISITS THE CORNFLOWER

Professor Bower compares what happens to a wave of pressure in a rubber tube filled with water. "If one observer pinches one end of the tube," he says, "the stimulus is felt by an observer at the other end." We may be asked why a gentle touch to the tense cushion at the base of the leaf-stalk should make the leaf sink down. We may answer that there is a rapid change in the tenseness of certain cells in that position; but why the touch should produce the change in tenseness we do not know. We can only say that the living matter is irritable.

In the cornflower there is a neat movement of the stalks of the five stamens which surround the pistil. They are united by their anthers and curve outward between there and their base of attachment. When a bee visits the cornflower and touches the sensitive hairs of the stamens, the curved stalks straighten and contract, drawing the anther tube downward. The effect is to brush out the pollen on to the bee's body, and the insect is thus in a position to dust another flower which has its stigma expanded. In this case there is sensitiveness to touch and a real usefulness in the change. This is only one of several flowers which show this peculiar sensitiveness, and which are pollinated in some such manner as we describe.

THE CAPACITY FOR MOVING AND FEELING THAT A PLANT HAS

On sunny slopes where the soil is loose we often see the rock-rose, a low-growing plant with beautiful yellow flowers. If we touch the numerous stamens when the flower is basking in the sun, they exhibit a very marked movement which, perhaps, helps to dust the insect-visitor's legs. The flowers of the barberry have also irritable stamens, and there are other cases. It seems as if the capacity for feeling and moving were always present in the plant, ready to be used should occasion arise.

In the flower of the musk the sensitiveness is in the stigma, the tip of the pistil, which has two lobes and gapes like a mouth. If you touch this stigma with a piece of grass, the two lobes close together, and this is what happens when pollen-grains are dusted by an insect-visitor. The closing of the lobes insures that the pollen is not lost.

The opening of flowers such as daisy and goat's-beard when there is sunshine, and their closing when it is dark or cloudy, may be of use in protecting the stamens and pistil from rain and cold; and, of course, there will not be many insect-visitors about in darkness or bad weather.

In the case of the crocus and the tulip, and of some other flowers, it is the heat and not the light of the sun that starts the movement. In some cases the opening and closing movements have been registered in the constitution of the plants. Thus the marigold opens in the morning and closes in the evening even when it is kept in darkness. *An internal rhythm has been established as part of its nature.*

THE FINGERS OF THE SUNDEW THAT CLOSE ROUND THE INSECT LIKE A FIST

We have already said that we are not very clear as to the usefulness of all the known movements of plants. One of the best illustrations of this is the Indian telegraph-plant, which grows in the basin of the Ganges. Its leaf has a main leaflet which is stationary, and two small ones which describe circles with jerky movements. There are also almost constant movements in the leaflets of wood-sorrel.

The beautiful reddish leaves of the sundew, which often grows out of the moss in the bog, have numerous spreading tentacles, both sensitive and mobile. Each tentacle bears at its tip a dewlike drop of sticky stuff which entangles the legs of small insects. The tentacle is stimulated by touch, and proceeds to imprison the victim. When one tentacle is touched, a message travels down it and influences other tentacles, which slowly curve inward. What looked like an outspread hand with many sensitive fingers becomes like a closed fist. Digestive juice is secreted round about the victim, which is then absorbed. After a while the tentacles expand again, ready for another meal.

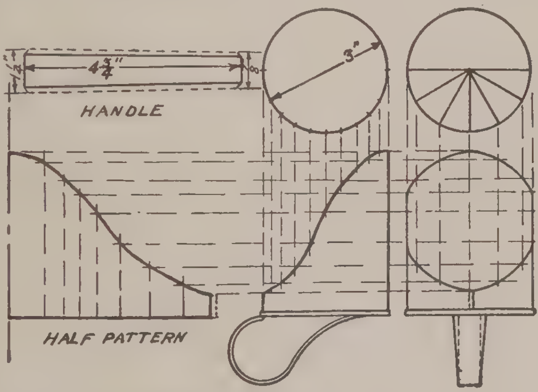
Still more striking is the Venus's fly-trap of Carolina. If the fly-trap has been induced to shut on something it does not want, it opens again quickly; and when it has been cheated two or three times in rapid succession, the plant ceases for a time to respond. Perhaps this is the nearest to mind that a plant ever gets.

THE NEXT STORY OF PLANT LIFE IS ON PAGE 881.

MAKE A SUGAR SCOOP FROM TIN CANS

CONTINUED FROM 628

THIS useful scoop can be made from those tin cans which you have been saving. It is easily made and will cost you practically nothing. First, select a tin can about 3 inches in diameter, and wash it clean. Then make a pattern or templet, by cutting paper of a size that will just cover the can. Now, remove paper and fold so that the fold runs with the length of the can. Next, draw half pattern, or outline, of the scoop desired on folded piece of paper as shown. After checking your drawing you should cut out the pattern as outlined. You are then ready to draw or scribe the outline on your can. This is done by placing the templet on the can so that the seam will be at the top of the scoop. You should mark carefully with either a sharp-pointed tool (scratch awl) or with a sharp-pointed pencil. In cutting to shape it is better to use curved metal snips, although straight ones may be used to cut almost to line. In making the second cut, be careful not to leave any sharp projections of tin on the edge. Any sharp projections may be filed off or removed with snips.



Working drawings of sugar scoop.

The handle is made (hemmed) and fastened as follows: First, select a piece of metal 1¼ inches wide (the one shown tapers to ⅞ inch) and as long as is needed for the handle (about 4¾ inches). Second, fold the narrow hem on each side as shown. If the can is long, one can will furnish enough tin for all of the problem. If not, others should be obtained. Third, shape the handle by using a mallet or piece of pipe as a stake and by bending the handle to the desired shape with the hem on the outside. Fourth, solder the handle, remembering that the soldering iron or *copper* must be thoroughly tinned before the handle is placed in position and soldered at the joint, as explained below. If you have not a soldering outfit, the handle may be riveted on as is also explained.

Two views of the finished sugar scoop are shown in the working drawings in picture 1. If desired, a cookie-cutter similar to the one shown in picture 2 may also be made even more easily than the scoop by selecting a tin can of the proper size, shaping the cutter, and fastening the handle as already explained.

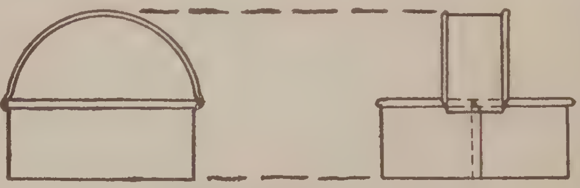
How to Retin the Soldering Copper. If for any reason the soldering iron or copper needs a new coat of tin, you must remove the black surface with a file. After you get it smooth, heat it nearly to the point where it begins to show red. Now rub on a soft brick or a block of sal-ammoniac to clean it. Next put a little solder on the block and work the tin over each of the four surfaces. This makes the point look bright and shiny like new tin. Your soldering iron or copper must be kept in this condition to work well. A cold iron is absolutely useless.

How to Solder. Ordinary soft solder is an alloy of tin and lead, usually about half and half. It melts at about 350° and unites easily with tin, lead, zinc, copper and brass, but not easily with iron or steel.

There are no secrets about the use of solder which may not be learned by the beginner, but the skill comes only with practice. However, there are four important points to be remembered by anyone who attempts to solder: First, the soldering copper must be kept clean and well tinned. Second, a good soldering flux must be used, and one which is suited to the metal (see information on soldering fluxes below). Third, the metals to be soldered must be clean. Fourth, the joint must be heated above the melting-point of the solder.

Soldering requires heat. You may use gas, coal or charcoal or a gasoline torch to heat the copper. If you use gas, take care not to let the copper get smoked up in the yellow part of the flame. The blue flame is hotter. To try if the copper is hot enough you may touch it to a lump of solder, or hold it near your face to test the heat. Do not overheat the copper or the tin will be burned off.

When you are ready to solder a joint, see that the surfaces fit well and are clean. Apply the soldering flux to the joint with a small brush. Do not spread the flux over a wide surface. Touch the hot copper to the end of a bar of solder and then to the joint. See that only a narrow edge of the copper touches the joint. Try to have the solder flow along with the copper. Do not try to work fast, as the heat must flow ahead of the solder and this takes time. Do not run back and forth over the joint, but move in one direction. When the joint is soldered, do not move it too soon but wait for the solder to set. Unnecessary solder may be wiped off with a cloth after heating a surface, but this should not be a common practice.



Cookie-cutter made from a can.

Information on Soldering Fluxes. A flux is a material in any form—powder, paste or liquid—which helps to make the solder unite more easily with the metal. Most of these fluxes have some chemical action on the metals, but some appear to do little but keep the solder flowing easily.

A good flux for one kind of metal may not work well on others. For instance, rosin will not work well on anything but bright tin. A list of the more commonly used fluxes follows:

Rosin—either powdered or dissolved in gasoline or turpentine. Used for new work on tin plate.

Zinc chlorid—made by cutting zinc with muriatic acid or by mixing the commercial zinc chlorid with water. Used generally for all work.

Raw muriatic acid—also called hydrochloric acid, generally diluted with water, sometimes mixed with the zinc chlorid flux. Used for zinc, also for galvanized iron.

Commercial soldering paste—containing various mixtures. Used for electrical work.

Borax—in powdered or dissolved form, used for brass.

How to Rivet. Sheet-metal may be fastened together firmly by riveting, and many times where strength is necessary both rivets and solder are used. The size of the rivets used depends both on the thickness of the metal and on the strength required in the joint.

The tinner usually sets his rivets by what is called "blind riveting." He places the rivet under the sheets of metal and draws it through by driving a rivet "set" over it with a hammer. This process requires some practice, but makes a very firm joint because the rivet always fits the hole and may be drawn up very tightly. On some light work the rivet sometimes spreads out and stretches the metal around it. For this reason, and because it is easier to place them accurately, rivets may be set in holes already punched in the sheets of metal. This is always done in heavy work. This process is recommended for beginners, and the holes should be carefully located and punched with a solid punch over a block of wood on end grain.

In heading a rivet a light hammer is used, and light blows which form a head on the rivet slowly are necessary for good work. Use the rivet set to form a smooth head on the rivet.

Tinners' rivets, which are usually coated with tin, are sold by the box and are numbered 8 oz. or 10 oz. or 14 oz., which means that 1,000 rivets of one size weigh a certain number of ounces. Larger rivets from 1 lb. up to 16 lbs. are sold, which are rated in pounds or per thousand. Such rivets are used in building.

MUSTARD AND CRESS GROWN ANYWHERE

MOST people like mustard and cress, and it is at all times a very useful salad. A very interesting way of growing these little plants at any time of the year may be followed quite easily if the directions given are carefully observed.

All that we shall need for the purpose are a couple of wooden boxes, two pieces of clean flannel or blanket measuring a little more than the boxes do, and, of course, a packet each of mustard and cress seed. The first thing to do will be to take away the lids of the boxes, and then, without damaging the sides, knock out the bottoms as well. Now we take the pieces of flannel and tie one over each frame.

Each of these must be stretched over the place where the bottom of the box was, and held down to the sides by tying a length of string all round. Thus we shall have something which will be like a square tambourine, only instead of parchment or paper there will be flannel. One of these boxes is for the mustard, the other for the cress.

As mustard seed grows much more quickly than cress, it should not be sown till later. We take the box which we are going to use for the cress and thoroughly wet the flannel. Now we get our packet of cress seed and open it, and sprinkle the seed fairly thickly over the flannel. The temperature should be kept fairly even, and not allowed to fall below 65° Fahrenheit.

It will be found that the seeds will stick well to the damp flannel and will not roll about. If we want the seed to grow very quickly, we shall put the box, when the seed has been sown, into a warm, dark cupboard. Twice a day the seeds should be looked at, and if it seems that they are at all dry, they must be well sprinkled with water. At the end of three days the seeds should have started into growth, and we shall be able to see the little shoots and roots breaking through the cases.

It is now time to sow the mustard seed, and this must be accomplished in just the same way as was adopted in the case of the cress. As soon as the seed has been sprinkled over the flannel, we remove the box in which it has been sown to a dark place, such as a cellar or any cupboard.

It will now be necessary to remove the box with the cress into the light; if it is summer, we may place it in a sheltered place out of doors, but in winter the situation chosen should be in front of a window in a warm room.

All this time it is most important that the seedlings should on no account be allowed to want for water. During the winter it will be found that, if the water is given just lukewarm, the plants will grow much more rapidly. When the seedlings are about two inches in height, it will be time to gather our crop of salad. With a good large pair of scissors the stalks may be cut close to the flannel, and they will be found to be very tender, as, indeed, will be the leaves of the little plants.

A HANDY WRITING-BOARD

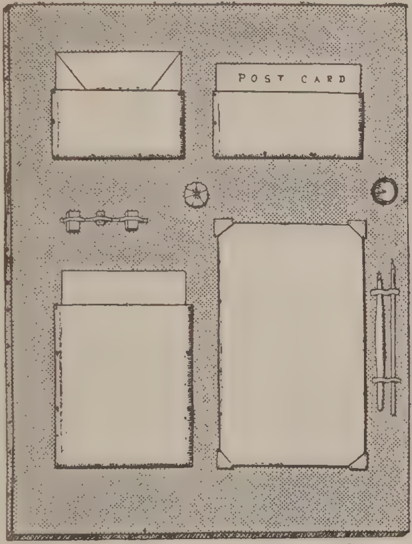
MOST people who have once used a writing-board know how convenient it is, and would be sorry to part with it. We can hold it in the lap and be independent of a table or writing-desk, carry it out of doors and sit on the grass or in a boat, or lie in a hammock while using it as we write to our friends.

The writing-board is quite easy to make. We shall need a piece of board, cut about 14 inches by 12 inches, and neither too heavy nor too thick. Three-eighths of an inch would be thick enough. Some drawing-boards are made about this size; in fact, an old drawing-board might well serve the purpose.

For the cover we can get some waterproof cloth, choosing a pretty art color. One is sold measuring 3 feet 9 inches in width at twenty-five a yard. If we prefer it, a green baize or felt may be used. Half a yard of the waterproof cloth would be enough, since it is 45 inches wide. Some small brass-headed nails and a yard of broad black elastic will also be wanted.

The first thing to do is to cut the waterproof cloth to the shape of the board. It should cover the board, front and back, and be tacked neatly round the edges of the board or on the back. Be sure no ragged edges show.

Next, we cut out three pieces of the oilcloth to form pockets for the note paper, envelopes and postcards, according to the size of those we use, taking care to make the cloth wide enough to allow for a good supply of these.



Writing-board with stationery, ready for use.

A good arrangement would be that shown in the picture, with note paper in the bottom left-hand corner, envelopes in the top left corner, and postcards in the top right corner. For the bottom right-hand corner blotting-paper may be cut out and folded into a pad. Its corners can be inserted into little triangular pieces of the waterproof cloth nailed in position as shown. To the right of the blotting-pad two pieces of broad elastic are nailed to hold the fountain-pen and pencil. Between the note paper and the envelopes we nail a piece of the elastic across to hold india-rubber, ink-eraser and stamps, taking care that the centre loop is tight to the board for holding the stamps.

Of course, it is possible to fasten everything to the writing-board by bands of elastic, but the pockets keep the note paper, envelopes and postcards cleaner than if they were exposed.

A neat little addition to the writing-board is a small pen-wiper cut out of two or three rounds of cloth and nailed above the blotting-pad. In the event of an ordinary pen being used instead of a fountain-pen, a tiny safety ink-pot will be needed. In that case, a hollow can be grooved in the wood for this before the board is covered with the waterproof cloth, and a hole cut in the latter for the insertion of the pot. It would need strapping on to the board with elastic, and the suitable place would naturally be to the right of the blotter, above the pen and pencil. The board is now quite ready for use.

HOW TO HIDE IN THE OPEN COUNTRY

IN these days of scouting and camp holidays it is useful to know how to keep ourselves from being seen when out in the open country; so that if we are doing any serious scouting, or are playing any of the well-known scout games, we may hide from those we are watching or following.

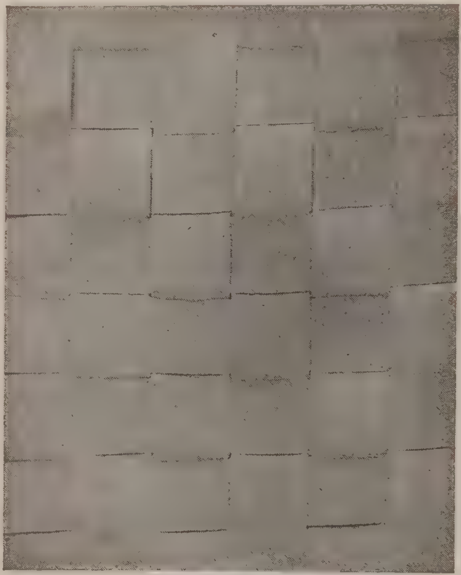
The first point to remember is that we should always keep low down—lying on the ground when still, and crawling when we move. To appear above the sky-line on rising ground is fatal to concealment.

A little thought and examination of our surroundings will enable us to select the best background for concealing ourselves. If we have to move across a tract of country that is probably being watched, it is wise to make ourselves look as much like the surroundings as possible. We remember that when the Scottish Prince Malcolm marched with an army against Macbeth, who was shut up in the Castle of Dunsinane, the attacking army came from Birnam Wood, and in order that their advance might not be noticed, each soldier carried a bough from a tree. Savage hunters often dress in the skin of some wild beast in order that they may pass unnoticed.

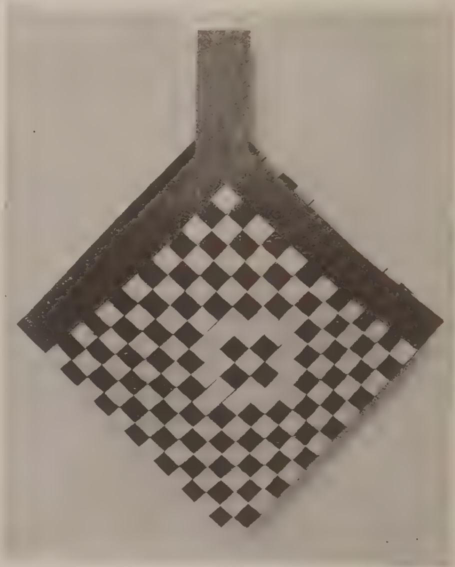
MAY BASKETS MADE WITH PAPER STRIPS

ATTRACTIVE May baskets can be made by using paper strips of various colors. First, secure a few sheets of tough paper and cut strips ½ inch or more in width. The pieces should be about 12 or 14 inches long. The base of the basket is woven by the over-under method (see picture 1), allowing the ends to extend. When a base of the desired size is secured, push the strips closely together, and bend them upward at right angles to the bottom. Then take a long strip and weave in and out around these upstanding strips. Next crease the corners. Now finish this by weaving far enough around the second time to tuck the end in securely. This first strip woven in should be pushed down close to the bottom. After weaving in another strip, and as many more as are desired, be certain that you go outside of the spokes of which you went inside the last time around. When the desired number of rounds have been made, leave the two middle upstanding spokes on each side. Be sure to cut the others so that they extend above the weaving a length nearly twice the width of a strip. You may now bend each spoke down so that it weaves into the basket and the end disappears. To strengthen the edge a second strip may be woven around, directly over the last one, before the spokes are turned down. To make the handle, braid the four remaining spokes so that they interlock. Then bind the handle with another strip wound around and around, and fasten the ends securely.

This May basket is now ready for the flowers which either your friend or your family are certain to appreciate. If you wish to modify the use of the over-under method of weaving you should study its application as shown in picture 2. The design in the middle is made by varying the weave to go over two or three as needed to secure the desired result. This variation can be repeated to form a symmetrical pattern.



1. Over-under weaving.



2. A varied design.

MAKE AND USE A SIMPLE BOOKLET

A USEFUL booklet may be made by folding a long strip of paper back and forth several times, vvvvv. It is interesting to note that the first booklets which man made with pages were constructed in this simple manner. A collection of pictures or drawings may be prepared for this little book. These may deal with one or more subjects. These pictures or drawings should be pasted into this book formed with the folded strip of paper. Care should be taken in placing each picture upon the folded page form. The name of the book may also be printed on the outside sheet, which may be made to serve as a cover. This suggested use for such a simple booklet is only one of the many which will occur to you.

Another easily made booklet is constructed by fastening together the pages (these may consist of regular sheets of paper 8½ inches by 11 inches or 5½ inches by 8½ inches) by means of punching and lacing. A satisfactory cover may be made from flexible paper. If a suitable cover design is added, this booklet will prove attractive as well as useful. The method of block printing which has been explained on page 617 will lend itself admirably to a simple cover design which will beautify the booklet. The design may be drawn in india ink or it may be painted with water colors, according to the liking of the maker of the booklet. Care ought to be taken to choose matching colors if paints are used.

LITTLE PROBLEMS FOR CLEVER PEOPLE

WHEN DID ALFRED REACH SCHOOL?

Alfred had a fairly long walk to school every morning. When he got as far as the church he had walked one-quarter of the way, and it was usually half-past eight on the church clock when he passed it. When at the railway station he had walked one-third of the way, and it was usually twenty-five minutes to nine on the station clock when he passed it.

At what time did he usually reach school?

WHEN WAS THE WATCH RIGHT?

At noon on Monday Herbert asked his father what time it was. His father told him that it was noon, and said that his watch was two minutes fast. On Wednesday morning Herbert again asked the time, and his father replied that the exact time was eight o'clock, but added that his watch was one minute slow. Herbert then told his father at what time his watch had been exactly right. Could you have done it?

HOW WAS THE FERRY CROSSED?

Fred and Albert, with their father and the village postman, stood at the ferry, waiting to cross. Fred and Albert each weighed 112 pounds and their father and the postman each weighed 224 pounds. But the boat could carry only 224 pounds at once.

How did they cross?

THE HARE AND THE HOUND

A hare was sixty of her own leaps in front of a greyhound, and took three leaps while the hound took two; but the hound went as far in three leaps as the hare did in seven. In how many leaps did the greyhound catch the hare?

HOW DID THE SHEEP STAND?

"I saw an odd sight the other day," said Brown. "Two sheep were standing in a field, one looking due north and the other due south. How do you think that each could see the other without turning round?"

Can you give the answer?

HOW MANY SEATS IN THE HALL?

"Is there a good audience?" asked the lecturer. "Only one-third of the seats are filled," he was told; "but I think we should have filled the hall if the tickets had been 25 cents instead of 50 cents, and in that case we should have had $50 more."

How many seats were there?

HOW LONG DID HE WAIT?

"You have missed the train by a minute," said the station master, "but there is a train every few minutes." "If there were three more trains an hour," said the traveler, "and I had just lost a train by a minute, I should have a minute less to wait for the next." How long had he to wait?

WHAT WAS THE CARGO?

A ship's cargo was unloaded by 25 barges, each barge taking 3 loads. But if each barge had been large enough to hold 160 tons more, there would have been only 1 load each. What was the cargo?

HOW MANY DUCKS?

"How many ducks did you drive home?" asked Farmer Bell. "There were two ducks in front of a duck, two ducks behind a duck, and a duck in the middle."

What was the smallest number of ducks Farmer Bell could have had?

THE ANSWERS TO THESE PROBLEMS ARE IN THE SECTION BEGINNING ON PAGE 891.

HOW DID THE LADIES CUT THE CARPET?

THREE Japanese ladies possessed a square ancestral carpet of considerable value, treasured as an interesting heirloom in the family. They decided to cut it up and make three square rugs of it, so that each should possess a share in her own house.

How did the Japanese ladies cut this carpet?

One lady suggested that the simplest way would be for her to take a smaller share than the other two, because then the carpet need not be cut into more than four pieces.

There are three easy ways of doing this, which we will leave you the amusement of finding for yourself, merely saying that if you suppose the carpet to be nine feet square, then one lady may take a piece six feet square whole, another a six-foot square in two pieces, and the third a three-foot square whole. But this generous offer would not for a moment be entertained by the other two sisters, who insisted that the square carpet should be so cut that each should get a square mat of exactly the same size.

Now, according to some wise people, the Japanese ladies would have found it necessary to cut the carpet into seven pieces in order to get the mats the same size, but Mr. Dudeney tells us, in The Canterbury Puzzles, that a correspondent in Tokio has assured him that they did it in six pieces only. Can you cut out the six pieces that will form three square mats of equal size? The way this was done is explained in that part of our book beginning on page 891.

RECIPES FOR CANDY

MOLASSES CANDY

MOLASSES candy was made by our grandmothers, but it is just as popular to-day. It is such fun to make, for we can pull the golden brown taffy until it turns into delicious yellow strands. Before we make our candies, it is a good plan to gather together all the materials we need for cooking. The ingredients necessary for this candy are: 2 cups of molasses, 3 tablespoons of butter, ⅔ cup of sugar, and 1 tablespoon of vinegar. First melt the butter; then add the molasses and sugar, stirring until the sugar is dissolved. Boil over a slow fire until it is brittle when tried in cold water. If you use a confectioner's thermometer, it should register about 255°. Just before removing from the fire, add the vinegar, which will make it foam up delightfully. Pour into well buttered pans. When cool enough to handle, you may pull until it turns light colored. Draw into sticks and cut into inch lengths. If you wish molasses nut candy, add 1 cup of chopped nut meats and a pinch of salt, just before taking the candy from the stove.

COCONUT FUDGE

THIS is a delicious variation of the ever popular fudge. These are the materials necessary: 2 cups (1 pound) of sugar, ½ cup of milk or cream, 2 squares of chocolate, 2 tablespoons of butter, 1 teaspoon of vanilla, 1 cup of grated coconut. Cook the sugar, chocolate and milk together until it forms a soft ball when tried in cold water, or until the thermometer reads 240° Fahrenheit. Remove from the fire, and stir in the butter, coconut and vanilla. Beat hard for 5 minutes, or until it is thick and creamy, and pour into a buttered pan. When it is cool, cut into squares.

STUFFED DATES

OPEN a box of dates, wash them in warm water, and remove the stones by cutting along the side with a sharp knife. Put a small piece of walnut in the date, and press the sides together again. Then roll each date in sugar. The dates may also be stuffed with peanut butter, or nuts of different kinds. They are very good when stuffed with preserved ginger and cherries chopped together, figs, bits of marshmallow, shredded coconut finely chopped, or salted almonds.

KARO FUDGE

THE following materials are needed: 1 pound of sugar, which is the same as 2 cups of sugar, ⅛ cup of Karo Corn Syrup, ⅔ cup of milk, 2 tablespoons (1 ounce) of butter, 2 ounces of chocolate or ½ cup of cocoa, and 1 teaspoon of vanilla.

Put the sugar, corn syrup and milk in a pan and stir until the sugar is dissolved. Then add the finely chopped chocolate, and stir until melted. Cook slowly, stirring it but little while boiling. After 15 minutes see if it has reached the soft-ball stage, or if the thermometer reads 240° Fahrenheit. If so, remove the pan from the fire, stir in the butter and vanilla and beat the candy until it begins to cream and to show fine grains around the edges of the pan. Do not beat too long or a gloss will not show on top. Pour into buttered pans, and mark in squares when cool.

DATES WITH FONDANT

FOR 20 dates we need ½ cup of fondant. The fondant is made as follows. Beat the white of an egg until stiff, add 3 tablespoons of water, and gradually 5 cups of confectioner's sugar. When it is almost stiff, add the vanilla, and when it rolls away in the form of a ball from the sides of the dish, put it on a board powdered with confectioner's sugar. Knead it as though it were bread dough until it is well mixed. Roll the fondant into sticks about one inch wide, and cut small pieces crosswise. Place a strip in the centre of each date, and sprinkle with powdered sugar.

FIVE-MINUTE PEPPERMINTS

THERE are so many recipes for peppermints that it is difficult to choose, but here is a recipe that is reliable. It is a little hard to make these candies for the first time, as there are so many things to remember, but when we learn the knack of it, they are very easy. The materials needed are: 1 cup of white sugar, ¼ cup of boiling water, ⅛ teaspoon of cream of tartar, 6 drops of peppermint, and a bit of coloring paste.

First make the fondant. Put the sugar and water in a pan over the fire, stirring constantly until the sugar is thoroughly dissolved. Remove the spoon and do not stir again while it is boiling. When the syrup first boils, add the cream of tartar. This cuts the grain and helps to keep it creamy. Before it boils, carefully wipe the sides of the kettle with a cloth or brush dipped in hot water. Every particle of the sugar must be melted before the syrup begins to boil, and it is important that no sugar grains remain, as it will make the fondant gritty. Cover the pan, as the steam formed will help wash down the sides of the pan.

Let the syrup boil 5 minutes or until the thermometer reads 240° Fahrenheit. Never stir or shake the syrup while boiling. Remove from the fire, and when cool, beat until creamy. With a medicine dropper, add 6 drops of oil flavoring, and add the coloring matter, which may be purchased in small tubes for a few cents.

Drop in small round-shaped pieces from tip of spoon on waxed paper or marble slab. Do not disturb until the drops are hard and look dull on top. The coloring matter is not necessary. They are just as good white, but more attractive if colored pink or light green.

BARLEY SUGAR

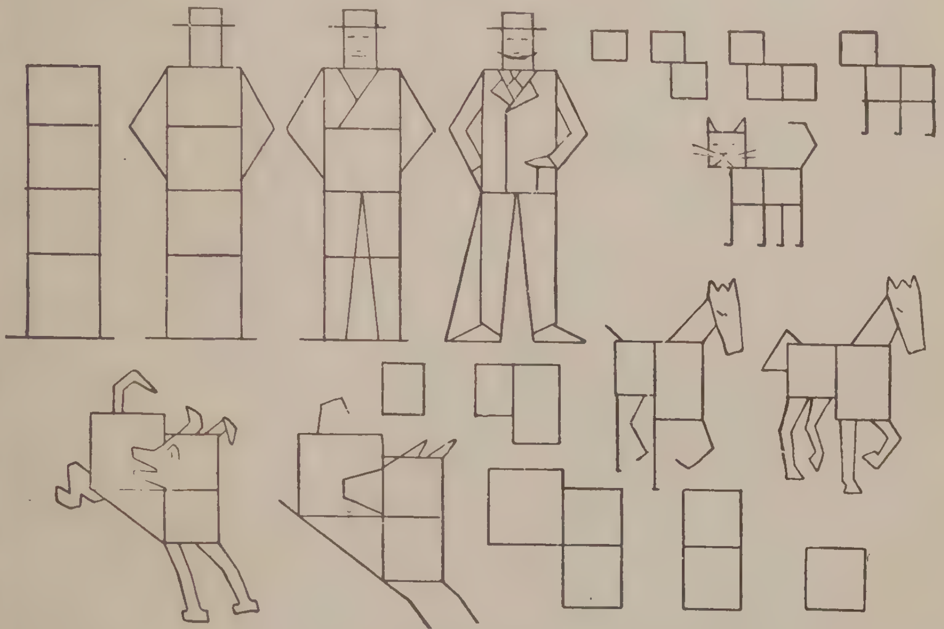
PUT into a pan and boil 1 pound of loaf sugar, 1½ teacups of water, and a tiny pinch of cream of tartar. Test it by dipping in a wooden skewer and plunging this in cold water. If the sugar is brittle it is ready for the addition of the juice of a quarter of a lemon and a little saffron coloring. Let it boil to 300° Fahrenheit by the thermometer, pour it on to a sweet-oiled marble slab, and cut it into strips with scissors. Twist these and store them in air-tight glass bottles.

BURNT ALMONDS

DISSOLVE 1 pound of brown sugar in a teacup of water, and stir this in a pan over the fire till it comes to the boil. Cease stirring for 2 or 3 minutes; then add ½ pound of blanched almonds, and stir quickly till the sugar browns and coats them. Turn them on to a wire sieve to cool.

QUEER PICTURES BUILT UP FROM SQUARES

THE quaint system of drawing by using squares as a basis, building up square upon square, and adding whatever lines are needed to complete the picture, has been invented by a French artist. This group of illustrations shows four subjects—a man, a cat, a horse and a dog—drawn by this use of squares. Look at the man. First four squares are made, one on top of the other; then two lines at each side of the top square give the outline of the arms; a tiny square, a horizontal line, and a rectangle represent the head and the hat; four lines give the features of the face; a series of simple straight lines in the topmost large square make the coat and the tie; the arms are completed in the manner shown; then an inverted V separates the two legs, the feet are made by two triangles, and the stick and mustache are added; finally the few superfluous lines are rubbed out and the man is complete. To make the cat from three squares as a basis is even simpler, and the method to be followed for it, and also for the horse and the dog, is clearly shown in the pictures on this page. This is a simple way to produce quite effective drawings.



A TRICK YOU CAN PLAY WITH A BOOK

THIS is a trick of a really startling kind, which will puzzle even the wisest man if he does not know it.

You invite someone, the older and wiser the better, to take down any book he pleases from the bookshelves, to open it haphazard, and to choose a word in the first nine lines of any page, and not later than the ninth word in the line. He is then to notice the number of the page, and multiply it by 10. To the product he is to add 25 and the number of the line. The result thus obtained is in turn to be multiplied by 10, and the number at which the word stands to be added to the product.

He is then to hand you the book, with a slip of paper on which are written the figures last obtained. After thinking for a few moments you open the book and read out the word chosen.

To obtain this surprising result, all that you have to do is to subtract in your mind 250 from the amount given you on the slip of paper handed to you.

The last figure of the answer will give you the number at which the word stands in the line, the last but one the number of the line, and the remaining figures the number of the page.

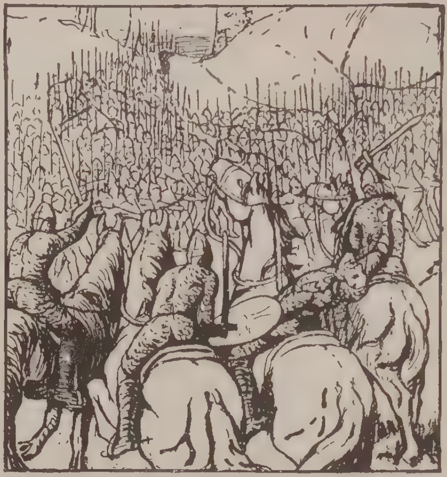
Suppose, for instance, that the person choosing the word had happened to choose the fifth word in the ninth line of the eighty-fourth page. In such case the process would be as follows:

$84 \times 10 = 840$
$840 + 25 + 9 = 874$
$874 \times 10 = 8740$
$8740 + 5 = 8745$
$8745 - 250 = 8495$

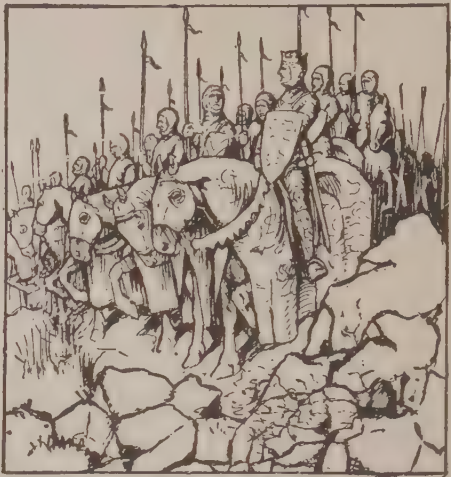
And 8495, dissected as explained, gives 84, 9, 5, being the three clues necessary to the discovery of the word.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 891.

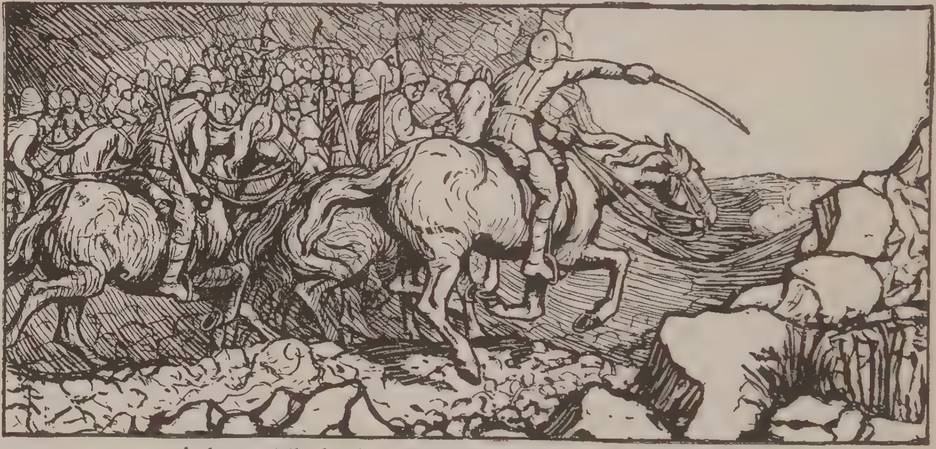
PUZZLE PICTURES FROM ENGLISH HISTORY



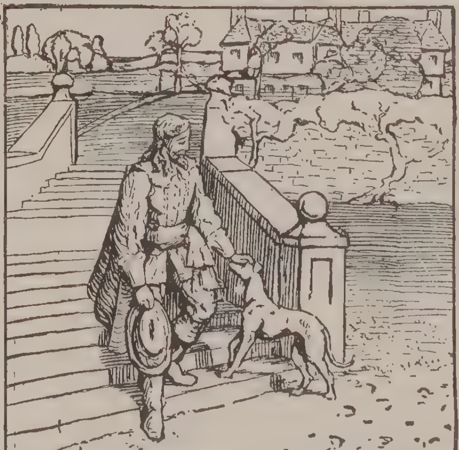
The death of Harold. Find William the Conqueror.



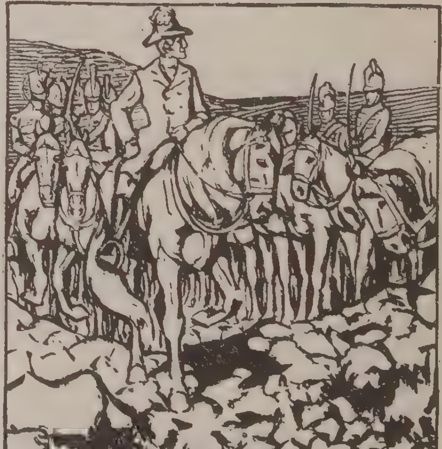
Edward I with his troops. Find Robert Bruce.



A charge at the battle of Blenheim. Find a number of generals.



Charles I. Find Oliver Cromwell.



The Duke of Wellington on his horse. Find Napoleon.

THE TALES OR STORIES WE READ

POPULAR tales were first circulated around from mouth to mouth among early peoples. They are simple in subject and form because they were told by simple people. Later, the tale developed into the great epics and poetry of more cultivated people, such as the epics of Homer, the Greek tragedies, the great Finnish epic, the Kalewala. Even among widely differing peoples many of these tales resemble each other, because they tell of the few situations and beliefs shared by all these people. Most early people, for instance, believed in magic, in friendly animals, and in the duty of being kind.

LITTLE CLAUS AND BIG CLAUS

CONTINUED FROM 541

LITTLE CLAUS was a poor little man with only one horse, and Big Claus was a rich big man with four horses. They lived in the same village, and every week Little Claus lent Big Claus his one horse for five days, and Big Claus lent Little Claus his four horses for one day.

"Gee-up, my five horses!" Little Claus used then to say as he went plowing.

"Don't say that," said Big Claus. "Only one horse belongs to you."

But Little Claus could not help saying it again, and this made Big Claus angry, and he got a great hammer and killed the one horse belonging to Little Claus.

Little Claus wept over the loss of his horse, and then he skinned it and put the skin in a sack, and went to town to sell it. But at night he lost his way, and settled down to sleep on a haystack. From the haystack he looked into a farmhouse, where a woman and a sexton sat drinking wine and eating roast meat, fish and pie with great enjoyment.

Suddenly the farmer returned. Now, the woman knew that the farmer hated the sight of a sexton, so before opening the door she put the wine away in the larder, and the meat and fish and pie away in the oven, and told the sexton to hide himself in a great box.

Little Claus saw all this and laughed, and the farmer heard him and invited him to come and sup with him. Little Claus and the farmer sat down to supper, and the woman brought them a dish of porridge. Little Claus did not like porridge, so he trod on his sack which he had put under the table and made the horse's skin squeak.

"What's that?" cried the farmer, looking all round the room.

"I have a conjurer in this sack," said Little Claus, "and he says he has conjured a good dinner for us into the oven."

"Wonderful!" cried the farmer, when he opened the oven and found all the nice things that the woman had hidden there.

Little Claus then trod again on his sack and made the horse's skin squeak.

"What does the conjurer say now?" asked the farmer.

"He says he has conjured some wine for us into the pantry," said Little Claus.

"Wonderful!" cried the farmer, when he went to the pantry and found the wine that the woman had hidden there.

"Now, could the conjurer conjure up an evil spirit?" said the farmer, when he had drunk the wine and become very merry.

"Certainly," said Little Claus, treading again on the sack and making the horse's skin squeak. "He says that if you will look in the great box you will see an evil spirit there in the shape of a sexton."

The farmer just peeped in the great box and saw the sexton, and closed the lid in a fright.

"What a wonder-worker your conjurer is!" he said to Little Claus. "If I had him, I should work no more.

Will you sell him to me for a bushel of gold, and take away the evil spirit in the great box and throw it into the river?"

Little Claus agreed to this; and the farmer brought a barrow and placed on it the great box and a bushel of gold. Then Little Claus said good-bye to him and wheeled the barrow along until he came to the river.

"Now," he said, in a loud voice, "I must throw this box into the water."

"No, no!" cried the sexton. "Let me out, and I will also give you a bushel of gold."

Little Claus did so, and on returning home with the two bushels of gold he met Big Claus.

"However did you get all that money?" said Big Claus.

"By selling my horse's skin," said Little Claus.

Big Claus at once killed his four horses, and took the skins to the tanners, and when they asked him the price, he said: "Two bushels of gold each."

"You can't make fools of us!" said the tanners; and, getting angry, they beat Big Claus black and blue.

On returning home Big Claus seized Little Claus and tied him up in a sack, saying: "You shall play no more tricks on me. I have stood enough and now I am going to drown you."

But the river was a long way off, and Big Claus got tired of carrying the sack. So he left it outside a tavern and went in to refresh himself. An aged drover came by with a great herd of cattle, and heard Little Claus saying: "At last I am going to heaven."

"I wish I were," said the aged drover; "for I am old and weary of life."

"Well, untie this sack and get in it instead of me," said Little Claus, "and you can go to heaven."

The aged drover set Little Claus free, and got into the sack, saying: "Tie me up, and you can have my cattle."

Little Claus tied the aged drover up in the sack, and set off home with the great herd of cattle.

Soon afterward Big Claus came out of the tavern and carried the sack to the river and threw it in. Coming back, he met Little Claus driving home the great herd of cattle, and cried in amazement: "Didn't I throw you into the river?"

"Yes," said Little Claus, "and I thank you for doing so. I fell on the soft grass growing in the river-bed, and a fairy opened the sack for me, and I found myself in a beautiful land crowded with sea-cattle. I got this herd together, and as soon as I have taken it home I am going back to get a larger herd."

"Do you think I could get some sea-cattle if I drowned myself?" said Big Claus.

"Of course you can try," said Little Claus.

Big Claus resolved to try, so he went to the river and threw himself in. He was, of course, drowned, and never came out to trouble Little Claus any more.

THE SEARCH FOR THE REAL PRINCESS

THERE was once a prince, and he wanted to marry a real princess. He traveled round the world in search of one, but there was always something not quite right about all the princesses he met. So he came home unmarried.

One stormy night a beautiful maiden came to the castle and said that she was a real princess. But she did not look like one as she stood there with her clothes streaming with rain.

The mother of the prince, however, determined to try her. She went into a bedroom and laid a pea on the mattress. Then she put twenty mattresses on top of the pea, and twenty feather beds on top of the twenty mattresses. She then led the princess into the bedroom, and in the morning she asked her how she had slept.

"Horribly!" said the dainty princess. "Heaven knows what was in my bed. I scarcely closed my eyes all the night. There was something very hard in the mattress, and my whole body this morning is black and blue with bruises."

The mother of the prince saw at once that the beautiful maiden must be a real princess. She had felt a pea through twenty mattresses and twenty feather beds! Nobody but a real princess could have such a very sensitive skin. So the prince married her in great joy, and the pea was carefully placed in the royal museum, where it may still be seen if nobody has stolen it.

LITTLE CLAUS AND BIG CLAUS

Little Claus had only one horse and Big Claus had four horses. Every week Little Claus gave Big Claus a loan of his one horse for five days, and Big Claus gave Little Claus a loan of his four horses for one day. "Gee-up, my five horses!" Little Claus was in the habit of saying as he went plowing. "Don't say that," said Big Claus. "Only one of the five horses belongs to you." But Little Claus could not help saying it. This made Big Claus angry, and he took a hammer and killed the horse of Little Claus.

DICK WHITTINGTON AND HIS CAT

DICK WHITTINGTON was a poor Gloucestershire lad who, having lost his father and his mother, went to London to make his fortune. His only friend in the world was a cat which he had picked up and fed when it was starving; and a very good friend it was to him, as we shall see.

Dick used to think that the streets of London were paved with gold, but he found that they were covered with hard stones, and on these stones he had to sleep with his cat for many nights. At last he got a place as a scullery-boy in the house of a rich merchant. Dick had to do all the rough work in the kitchens: he washed the dishes and turned the spits upon which the meats were roasted. Still he had a merry heart and might have been happy but, unhappily, the cook was a wicked woman, and she beat him every day and made him sleep in a garret overrun with rats and mice. These, however, were soon killed by Dick's cat, for the cat was an excellent mouser.

The rich merchant in whose kitchen Dick worked was a foreign trader. He used to fill his ships with all kinds of goods and send them to far countries, where the goods could be sold at a great profit; and being a kind man, he allowed all his servants to put in his ships anything that they wished to sell.

One day, when he was about to send a ship to trade with the Blackamoors, the inhabitants of a far-distant country, his young and pretty daughter Alice came into the scullery and said to Dick: "Now, what are you going to put in for sale this time?"

"I've only my cat," said Dick.

"Well, put in your cat," said Alice.

And to please her he parted with the only friend he had in the world.

But Dick soon began to miss his cat. The rats and the mice crept back to his garret and kept him awake at night, and the cook beat him more than she had done before. So hard did Dick's life become that one morning he tied all his things up into a bundle and set out to walk back to Lancashire.

He got as far as the village of Holloway, and sat down on a stone to rest, and Bow Bells began to chime, and the sound traveled across the fields:

"Turn a-gain, Whitt-ing-ton,
Thrice Lord Mayor of London."

That was what the ding-ding-dong of Bow Bells seemed to say to him. Poor Dick tried to laugh, and began to cry.

It seemed so impossible a thing! But he turned and went a little way along the road to Finchley.

"Turn a-gain, Whitt-ing-ton,
Thrice Lord Mayor of London,"

said Bow Bells, and he turned and went a little way along the road to Enfield.

"Turn a-gain, Whitt-ing-ton,
Thrice Lord Mayor of London,"

said Bow Bells.

"After all," said Dick, "it's only the cook who treats me harshly. How kindly Alice spoke to me! I will turn again, as the bells say, and see what happens."

Something happened as soon as Dick regained his master's house. The ship in which he had put his cat returned with the news that his cat had been sold at a great price.

On arriving in the land of the Blackamoors, the captain of the ship went to the king of the country and was invited to dine at the palace. There he saw an amazing sight. A beautiful meal consisting of all kinds of game and meat, tropical fruits and elaborate sweetmeats was served in honor of the guest. As soon as the dishes were placed on the tables, a vast crowd of rats and mice rushed out and devoured all the food.

"Oh dear!" cried the king of the Blackamoors, "I shall not get anything to eat again to-day."

"Good gracious!" said the captain. "You ought to keep a cat in your palace to kill all these rats and mice."

"A cat?" said the king. "What's that? Is it a new kind of lion? I have bought hundreds of lions and tigers of all sorts, but none of them would ever kill a mouse for me. I am becoming thinner and thinner day by day."

The captain sent a sailor to the ship to get Dick Whittington's cat. When the king of the Blackamoors saw how quickly it killed rat after rat and mouse after mouse, he clapped his hands and shouted with joy, and said that he would buy it even if it cost him half his kingdom.

"Will you take six sacks of gold for this wonderful little animal?" he asked.

The captain agreed, and the ship went to London laden with the six sacks of gold for Dick Whittington.

DICK WHITTINGTON LISTENING TO BOW BELLS.—From the painting by James Sant, R.A. Dick Whittington thought the streets of London were paved with gold, and went there to make his fortune. But he almost starved, and was walking home again when Bow Bells chimed and seemed to say: "Turn again, Whittington, thrice Lord Mayor of London." He went back, made his fortune, and became Lord Mayor.

The wicked cook told the merchant that Dick was only a poor scullery-boy without a friend in the world, and that there was no need to give him the gold. But the merchant was an honest man. He gave Dick all the money, and had him brought up as if he were his own son, and years after Dick married Alice. He was made Lord Mayor of London, and when he died left all his money to charity. Some people have doubted the truth of this story, but it is very interesting, and one that we like to believe.

THE NEXT STORIES ARE ON PAGE 851.

A TEA GARDEN IN CAROLINA

For years attempts have been made to grow tea in the United States. These pictures show a part of the gardens at Pinehurst, North Carolina. The land devoted to tea is surrounded by slender young pines. The plants in this part of the garden had grown old and straggling, and were cut back to the roots.

The pickers here are chiefly negro women and children, who pick the leaves carefully to avoid bruising them, and deposit them in the baskets. This garden produces an especially fine quality of black tea. The tea plants here seem to be able to withstand cold weather without great damage. Travelers say that they have never seen finer plants in Ceylon or India. Compare this picture with the others.

Tea-pickers at play after a day in the tea gardens in India.

THE STORY IN A TEACUP

CONTINUED FROM 645

WE think little of the tiny leaf which floats in our cup of tea, yet the little leaf has had a world of adventure. It may have grown in China, in India or in Ceylon. It has sprung up on land rich with the leaves of a dead forest; it has borne intense heat, and flourished through the heaviest rains.

It may have reached its prime on a sheltered plain, or attained perfection on a loam-strewn mountainside. And when the life of the leaf upon the plant is ended by the picker, machinery takes it, crushes it and ferments it, and bakes it, and sorts it, and packs it, and sends it forth.

Nobody can say definitely when tea was first used. Certainly it was known to the Chinese more than five hundred years before Christ was born. It is believed that tea was first used in China, not for the preparation of a beverage, but for a medicine. By the eighth century the custom of tea-drinking was so popular there that the first of a long series of taxes was imposed upon the article. After that tea-drinking spread rapidly among the Chinese and Japanese. Since it became known to Western countries, in the seventeenth century, "China" and "tea" have been inseparably connected.

The gigantic tea industries of India and Ceylon which have grown up in the last century have to some extent driven Chinese tea from the markets of the world. Still China has such an enormous population of her own tea-drinkers to supply that it is probable she will continue to be the chief tea-producing country in the world, even if she does not export so much to other lands. Russia is also one of China's good customers for tea.

Besides China and Japan, the principal tea-drinkers are the peoples of the United Kingdom, the British Dominions, Russia and the United States. When tea first made its appearance in England, early in the seventeenth century, it was so great a novelty that people paid from $30 to $50 a pound. At such a price it could never have become popular, but fully a hundred years later it still realized five dollars or more a pound in London, and the principal shop at which it was sold combined the business of tea-dealing and banking.

As more tea came, prices became lower, and so great was the demand that the fastest ships were devoted to the tea trade. As soon as they got their cargo they raced home, and the ship which arrived first got the best price for the new season's crop. In 1866 three little sailing ships left Foochow, on the coast of China, together, made the voyage of fully 16,000 miles in ninety-nine days, and were docked in London within two hours of one another. The use became common in America before the Revolution, and you remember that the tax on tea was an important question in those stirring days.

With the growing demand for tea from China, the East India Company thought that they might introduce the growth into India, and sent to China for seeds. But before the messengers returned, tea was discovered growing wild in Assam. Planters lost no time in cultivating it, and after about 1840 increasing quantities were sent to London. The plant has been introduced into Formosa, Java, Ceylon and South Africa.

A tea plant is ready for the picker when it is about four years old. The pickers, carrying a basket slung upon their shoulders, and supported by a band passed round the forehead, enter the plantation and go from tree to tree. They take only a few buds and young tender leaves from each, and as they pick, toss them into their baskets. When filled, the baskets are carried to the factory, and their contents weighed. The plant continues to grow all through the warm rainy season, and picking goes on from day to day as new leaves come out.

WHAT HAPPENS TO THE TEA AT THE FACTORY

At the factory the process of preparing tea is carried out. The tea is first emptied out on to shallow trays, and a pound of tea covers an area a yard square. The trays are then carried to a heated room, through which a strong current of air is forced. This is to soften and wither the tough leaf, which is ready when it has become quite soft and flaccid. The process usually occupies from eighteen to twenty hours. Special machines consisting of cylinders rotating in hot air are sometimes used instead of the open trays. Then the leaves are passed through a machine which curls them and presses the juice out on to their surface. After this the tea is spread out in darkened rooms or placed in drawers in layers one or two inches thick, and then covered with damp curtains so arranged that they do not actually touch the leaves. The heat and moisture cause the tea to ferment, after which it goes through a sort of baking process for a little while to arrest fermentation and to dry out the moisture caused by it. During fermentation the leaf changes its color, and the flavor develops. Black and green teas come from the same plant. The green tea is not allowed to ferment, but is steamed and baked soon after it is gathered.

The leaves must now be sorted into sizes and qualities. Sieves of various meshes are employed for the purpose. Then, after a second drying, the tea is ready for market. It is packed by machinery into chests lined with lead, and away it goes to the ship. Great care must be exercised in the choice of wood for the chests, because tea readily absorbs odors and thereby loses its own flavor.

So far we have been speaking of the method of treatment in India or Ceylon, where, from the time that it is picked, the tea is not handled at all. In China it is different. There the tea is rolled by hand and trodden by foot. Machinery is now slowly being introduced, but it is a difficult matter to make changes in China. The people like to do things as they have always done them.

For many years attempts have been made to grow tea in the United States, and there are tea gardens at Summerville, South Carolina, and in other southern states. Several thousand pounds a year of excellent tea are produced, but the cost of labor is so much more than in the East that only expensive grades can be produced at a profit.

WHEN THE TEA SHIP ARRIVES

British people use the most tea, and the tea trade is quite important. When a tea ship arrives, samples are drawn from the cargo and sent to the merchants, who submit them to the tea-taster, so that they may have his opinion on the quality and the value of the shipment. He has a tiny pot of tea made from each, and takes a sip from each brew. Those that he likes he commends, and the merchant buys them at the sale.

When the tea reaches the merchant's warehouse it must be blended. The merchant has a book in which are recorded all the different qualities of the water in various districts. A tea which would be satisfactory if brewed in one part of the country would be quite unsuitable to the water of another part, and blending is therefore one of the important features of the tea industry in Great Britain.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 785.

PICTURE-STORY OF A CUP OF TEA

According to Chinese writers, the tea plant has been cultivated for at least 5,000 years. In Ceylon, Assam, and other parts of British India, white overseers go about the plantations keeping an eye on the workers.

The shrubs need careful attention if they are to be grown profitably. The ground is hoed to destroy weeds, and the shrubs must be pruned to induce the sprouting of fresh shoots and to discourage flowering.

WORKERS IN THE TEA PLANTATIONS

Many boys and girls are employed in the plantations, and they soon become skillful pickers. If it were not for an abundance of cheap labor it would be difficult to know how tea could be grown profitably.

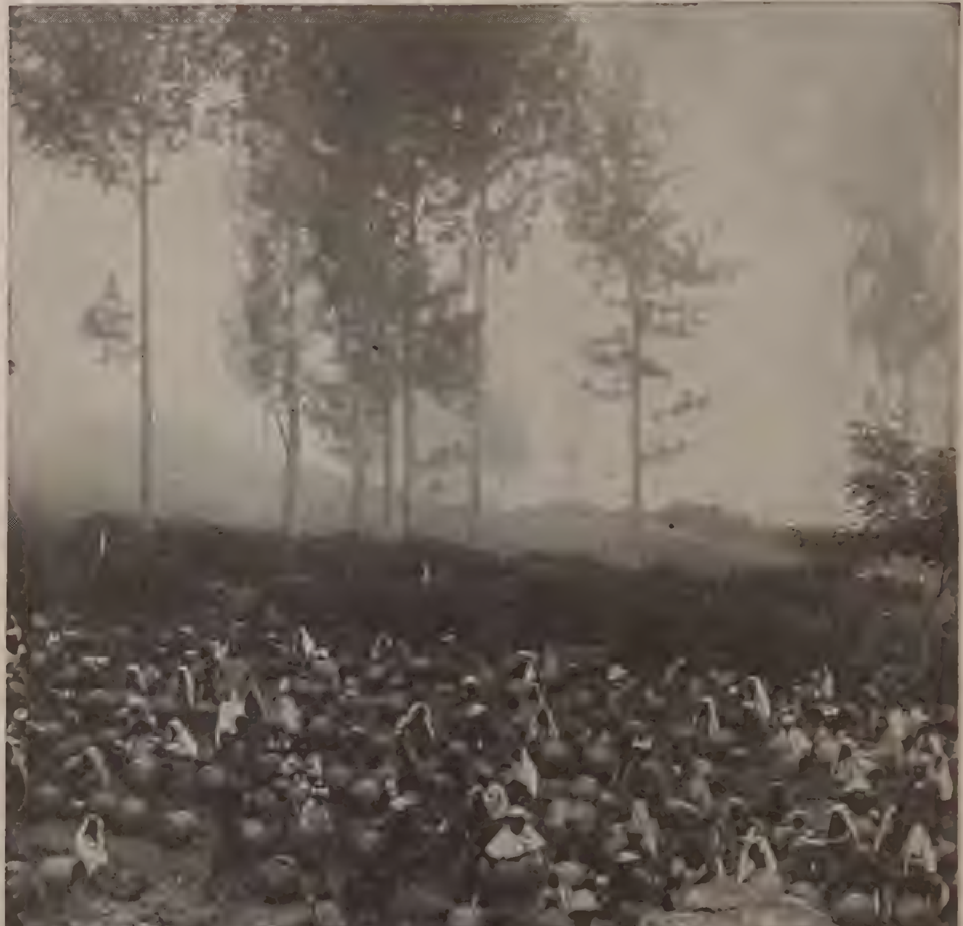
© Underwood & Underwood.

Less than half a century ago China supplied the world with tea, and a great deal is still grown in China, though less comes to Europe. Japan also produces much tea. This picture shows Japanese pickers at work.

THE LITTLE MAID AND THE TEA LEAVES

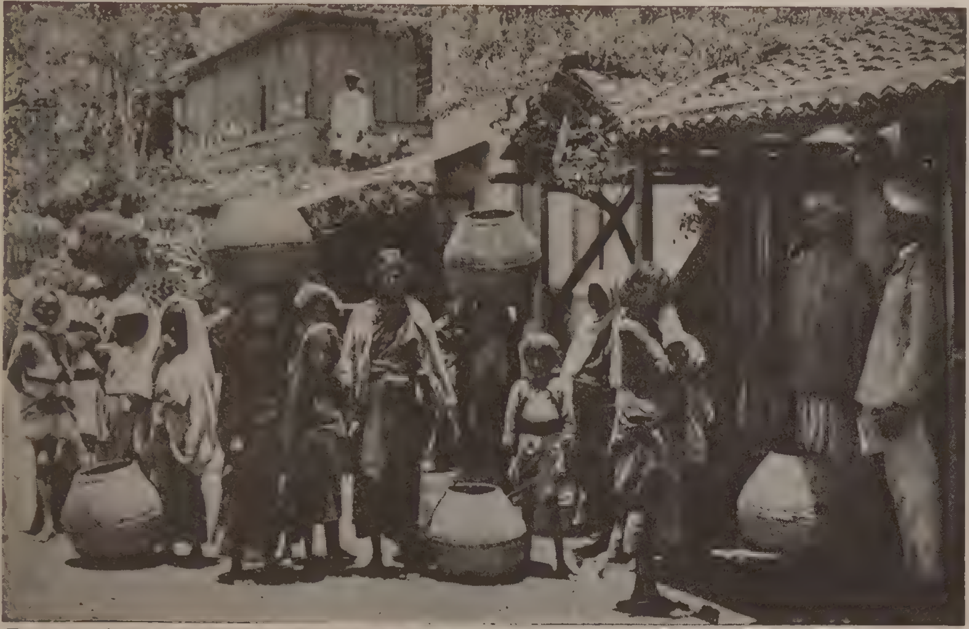
THE LEAVES WHEN READY ARE HAND-GATHERED BY WOMEN LIKE THIS CINGALESE

LOOKING OVER THE TEA AFTER PICKING

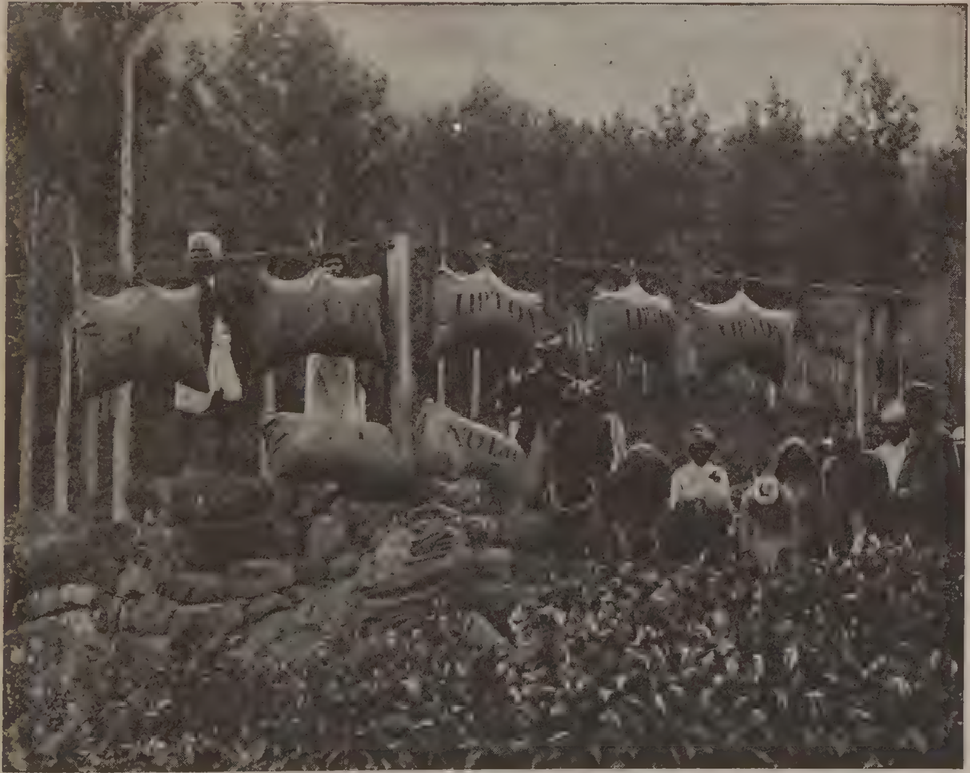


OVERSEERS ON A CEYLON PLANTATION EXAMINING THE LEAVES PICKED BY THE WORKERS

A DAY'S HARVEST GOES TO THE FACTORY

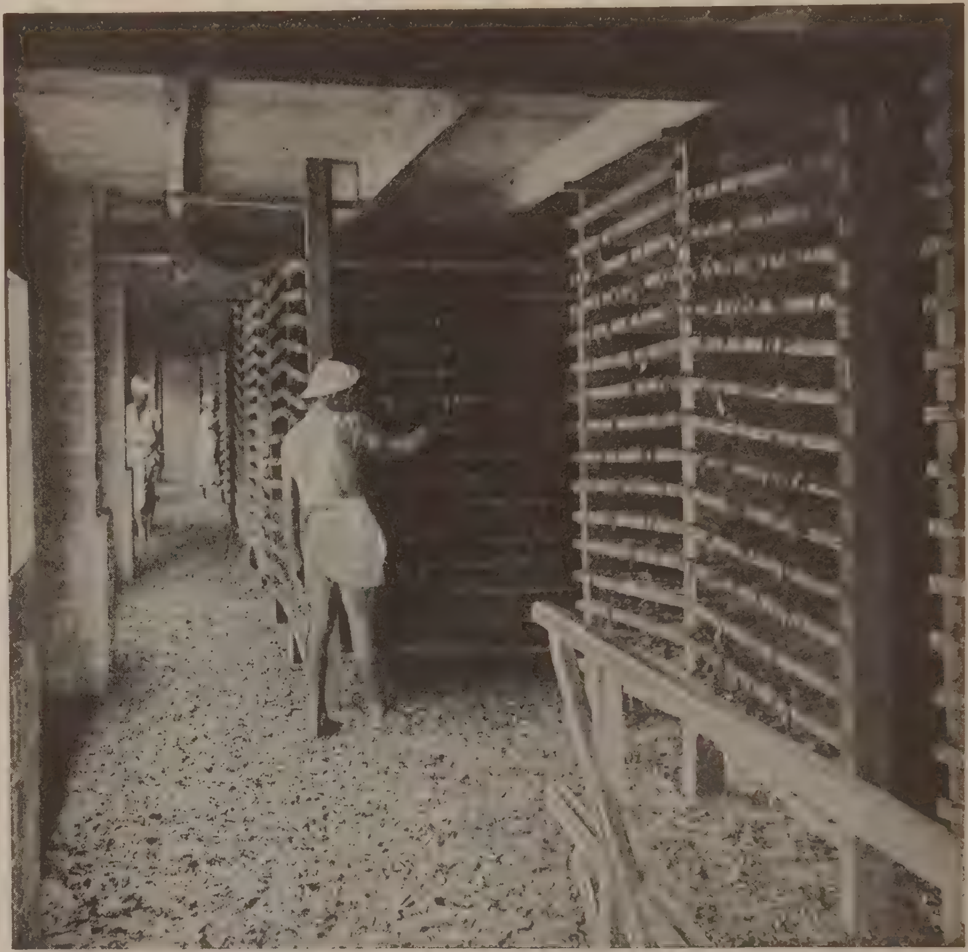


When the day's gatherings are brought in to be weighed there is a great excitement, and here we see the pickers at the weighing station on an Indian plantation. Women and children are among the pickers.



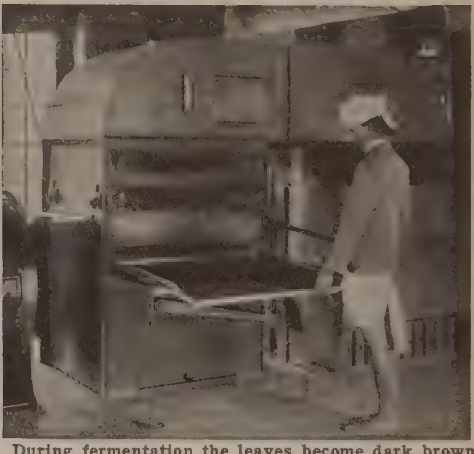
On some plantations in Ceylon simple mechanical contrivances have been set up to hasten delivery to the factory. This picture shows an aerial ropeway, along which sacks of leaves are run to the drying houses.

DRYING AND ROLLING THE TEA LEAVES



After being sorted the green leaves are spread out on long wooden trays in a house where they can get air to make them tough without becoming hard and stiff. Skill is needed to preserve the best flavor.

The leaves are taken from the trays and crushed between rollers. Then they are spread to ferment.



During fermentation the leaves become dark brown or black in color. Then they are heated.

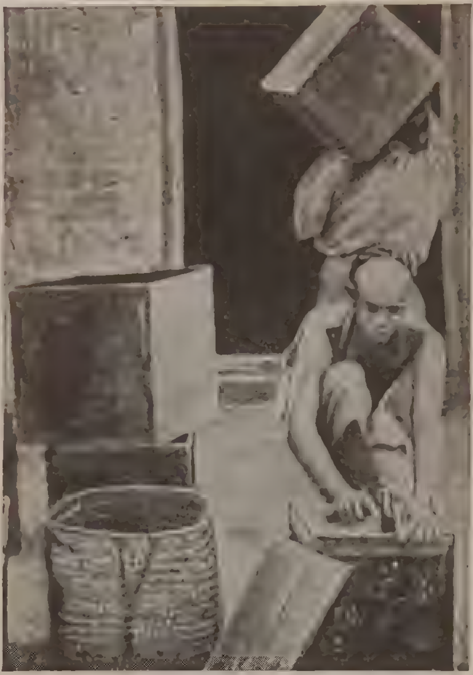
SORTING THE TEA FOR THE PACKER

The dried leaves are then spread out for examination as in this Ceylon factory.

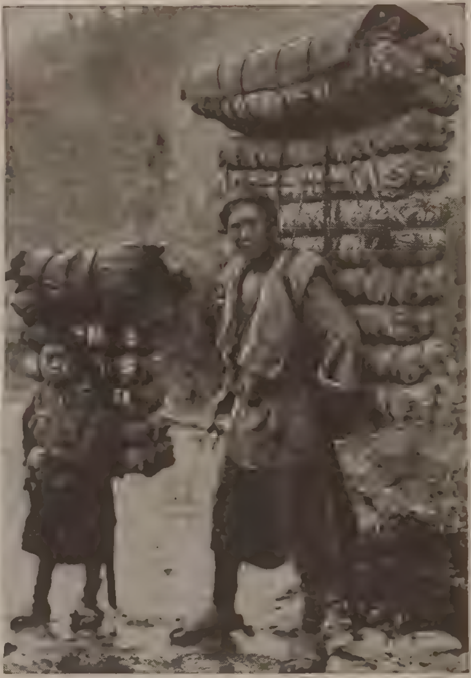
The same method is followed in China, trays of straw or cane being used.

In more modern factories machinery is employed for sorting, as in this factory in Ceylon.

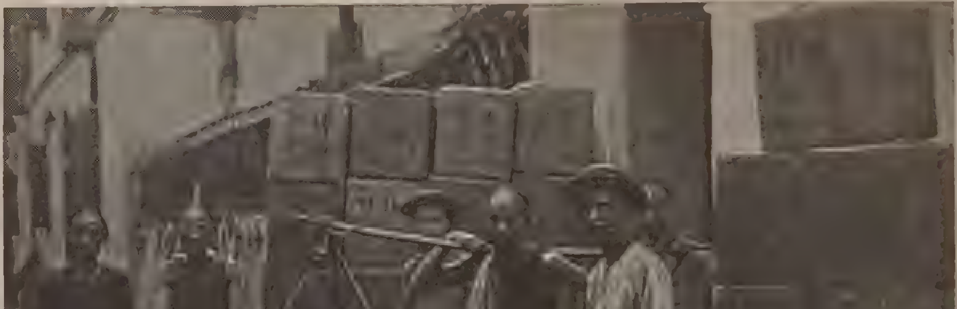
THE TEA IS READY FOR THE MARKET



The Chinese pack their tea in the old-fashioned way, placing it in large cases with lead foil all around. Coolies tread the tea down tightly with their bare feet.

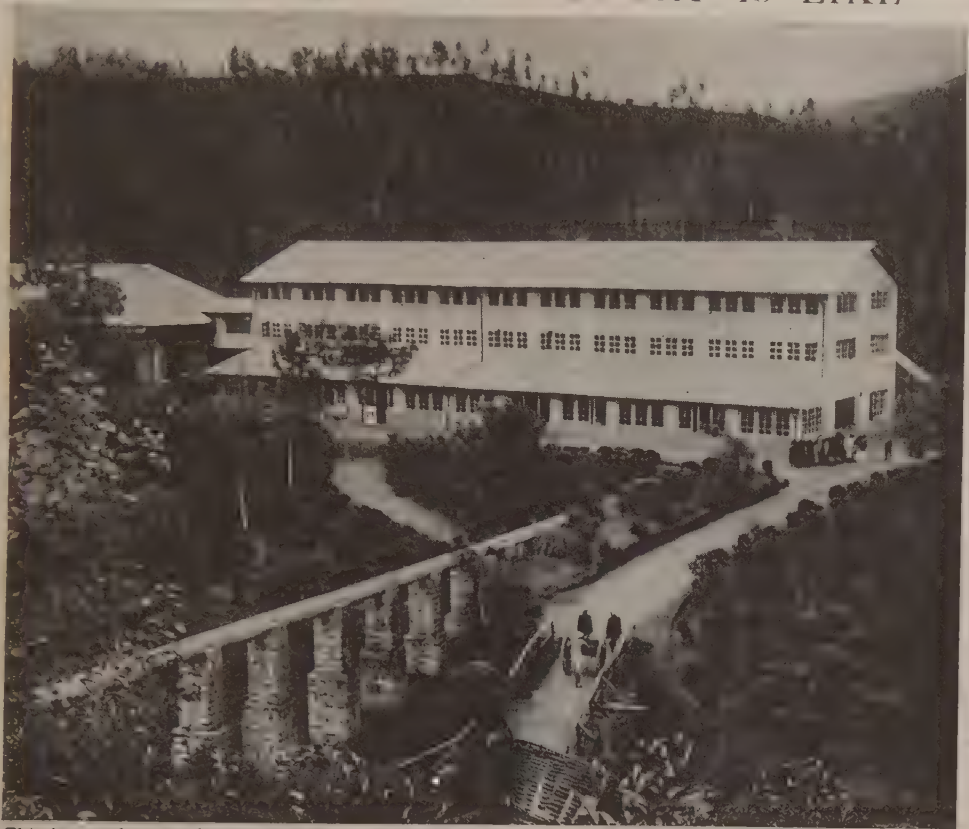


A great deal of the tea grown in China goes to Mongolia, Tibet, Siberia and Central Asia. Coolies carry it in wicker packages on their backs for hundreds of miles. © Underwood & Underwood.

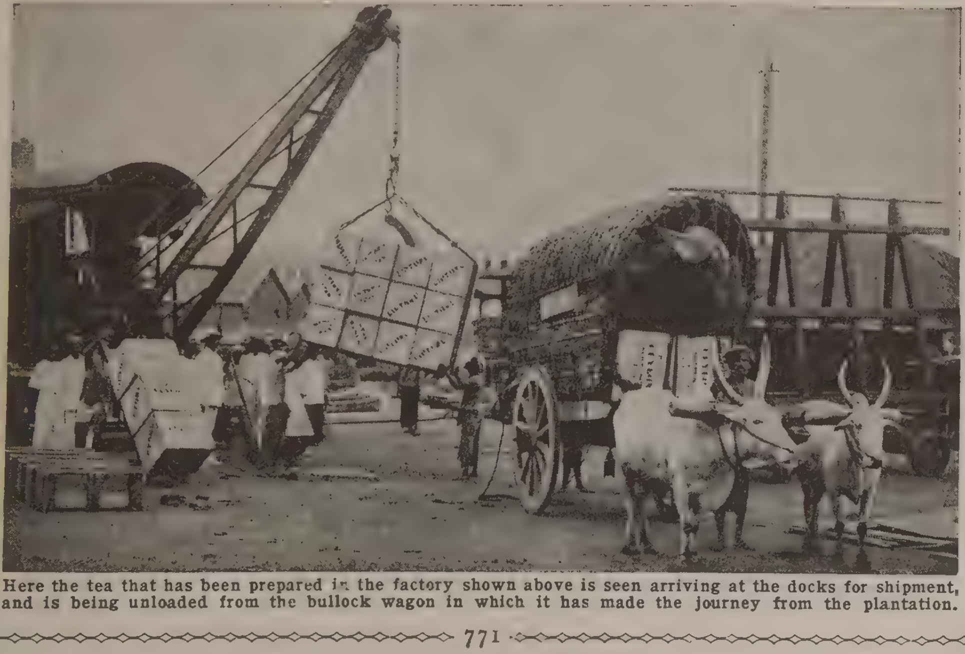


The tea that comes to us from China is sent in large cubical packages, and coolies carry it down to the ships on poles. Two large cases are suspended at each end of the pole, carried over the shoulder.

WHAT A BIG TEA FACTORY IS LIKE



This is a modern tea factory in Ceylon. It stands in the centre of the plantations, and each day the leaves gathered by the pickers are taken to the factory, where the process of preparing them for the teapot begins.



Here the tea that has been prepared in the factory shown above is seen arriving at the docks for shipment, and is being unloaded from the bullock wagon in which it has made the journey from the plantation.

READY FOR THE SHOPS AND THE TEAPOT

On some plantations the tea is made up into packages ready for sale in shops.

Much tea, however, comes over in bulk and is blended in London, as shown here.

The blended tea is packed into large cases, sealed, and sent to the grocer.

These pictures, courtesy The Indian Tea Association, Harrisons & Crosfield, Lipton, Ridgways and others.